

TECHNOLOGY DEPT.

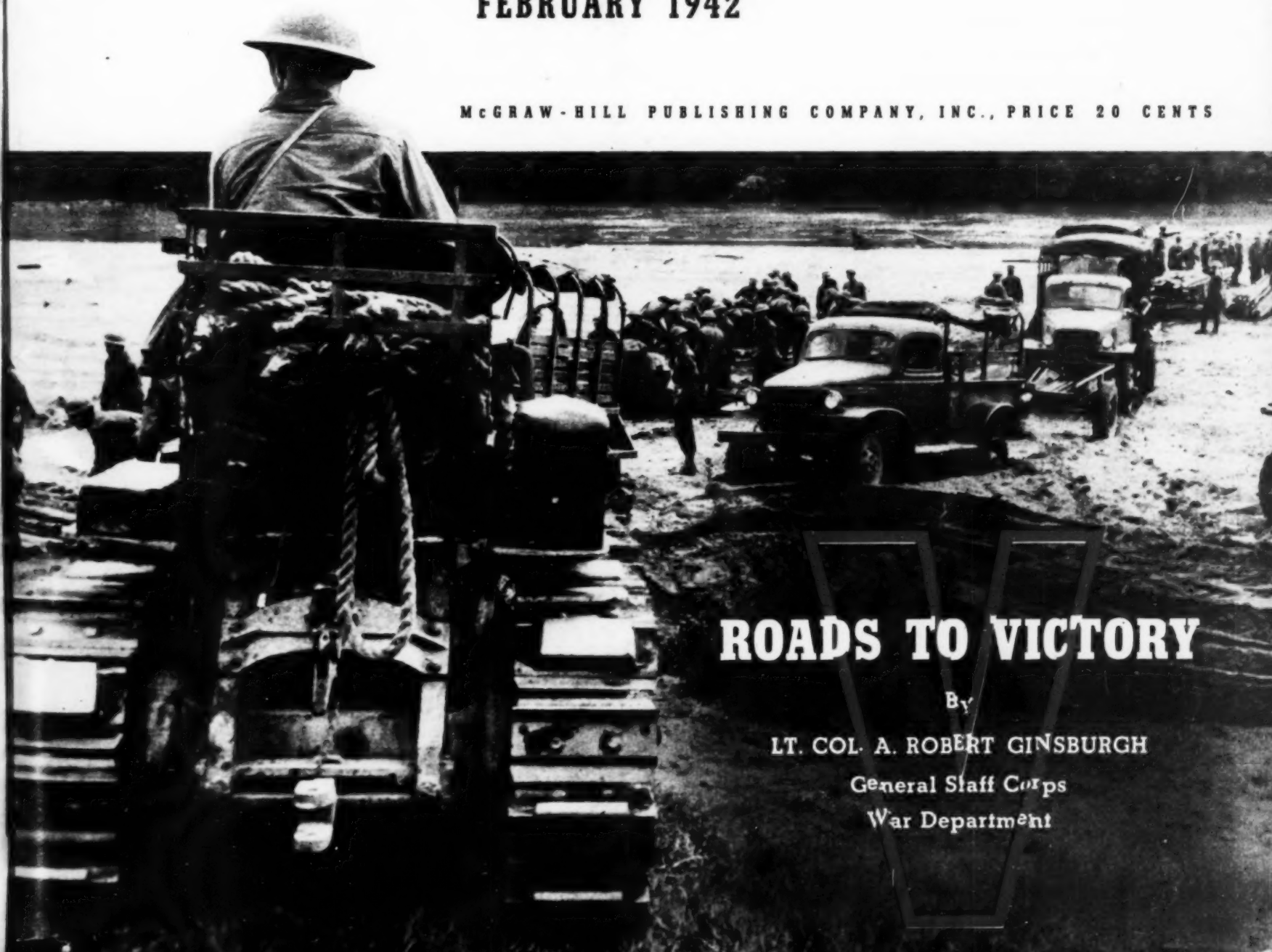
A PICTORIAL SURVEY OF CURRENT PRACTICE, EQUIPMENT AND MATERIALS

# Construction Methods

ROAD BUILDERS' NUMBER

FEBRUARY 1942

MCGRAW-HILL PUBLISHING COMPANY, INC., PRICE 20 CENTS



**ROADS TO VICTORY**

By

LT. COL. A. ROBERT GINSBURGH

General Staff Corps

War Department



# INLAND STEEL SHEET PILING

Made of special analysis steel providing unusual toughness and high tensile strength. The Inland Interlock permits free driving, yet remains watertight under pressure.

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# CURRENT JOBS

## .... and Who's Doing Them

### BUILDINGS

**Public**—In Marshall, Tex., **Ford, Bacon & Davis, Inc.**, of New York, will build a TNT manufacturing plant for the War Department at an estimated cost of \$23,000,000. **O. W. Burke Co.**, of Detroit, received an \$18,875,000 contract for tank arsenal addition at Detroit, Mich., for War Department. A bid of \$11,000,000 obtained contract to complete Triangular Division Camp at Fort Huachuca, Ariz., for **Gel E. Webb Construction Co.**, of Phoenix, Ariz., **Ford J. Twaits Co.**, of Los Angeles, Calif., and **Morrison-Knudsen Co.**, also of Los Angeles. Successful bidder for copper plant contract to be erected in Miami, Ariz., was **W. A. Bechtel Co.**, of San Francisco, Calif., with bid of \$9,000,000, to be financed by Defense Plant Corp. General Electric Co.'s \$8,000,000 turbo-supercharger plant in Fort Wayne, Ind., is under construction by **Stone & Webster Engineering Corp.**, of Boston, Mass.; Defense Plant Corp. will finance. A bid of \$4,000,000 obtained contract for east powerhouse for Grand Coulee Dam, in Washington, by **Consolidated Builders, Inc.**, of Grand Coulee. Contract for powerhouse superstructure, surge tank building, installing penstock and butterfly valves for Fort Peck Dam, in Montana, went to **Fegles Construction Co.**, of Minneapolis, Minn., for \$3,407,026.

Plant for production of tank armor for War Department in Granite City, Ill., will be constructed by **Frazier-Davis Construction Co.**, of St. Louis, Mo., for approximately \$3,268,000. **R. E. Campbell Co.**, of Compton, Calif., was awarded contract to construct 800-family housing project in Los Angeles, Calif., at cost of \$2,075,000. Low bidder for contract to erect temporary Federal office buildings in Washington, D. C., was **Charles H. Tompkins Co.**, local contractor, with bid of \$2,965,000. In Bremerton, Washington, **Howard S. Wright & Co.**, of Seattle, and **L. H. Hoffman**, of Portland, Ore., will build nine 2-story frame personnel buildings for Puget Sound Navy Yard, for \$2,500,000. **Perilliat-Rickney Construction Co.**, of New Orleans, submitted low bid of \$1,000,000 for cantonment contract at Camp Claiborne, La. In Merrimac, Wis., War Department awarded a \$65,000,000 powder plant contract to **Mason-Hanger Co., Inc.**, of New York, in place of Bechtel-McCone-Parsons Corp., of Los Angeles, Calif., as erroneously reported in December, 1941 issue of **Construction Methods**.

### HEAVY CONSTRUCTION

**Pan Construction & Materials Corp.**, Balboa, C. Z., submitted bid of \$63,223,458 for contract to construct new Gatun Locks in Panama. In West Virginia, **Seaboard Construction Corp.**, of Mount Kisco, N. Y., will build Bluestone Dam, for \$10,195,575. **E. G. M. Cape & Co. Ltd.**, of Montreal, Que., Canada, will construct airfield in Botwood, Newfoundland, at cost of \$2,926,100. Low bidder for Barker Dam, Houston, Tex., was **Macco Construction Co.**, of Clearwater, Calif., with bid of \$1,767,872. **E. J. Albrecht Co.**, of Chicago, Ill., was awarded contract to construct Berlin Dam in Ohio, at an estimated cost of \$1,250,000. For flying school in Waco, Tex., bid of \$1,856,580 by **J. W. Bateson**, of Dallas, was low. Airport is under way in Sydney, N. S., by **Dominion Construction Corp. Ltd.**, of Toronto, Ont., Canada, for \$1,528,000. Contract for sewage disposal plant in Stamford, Conn., went to **Thompson-Starrett Co., Inc.**, of New York, for \$855,226.

### HIGHWAYS

Among recent highway and bridge contract awards are the following: Florida: \$337,108 to Belcher Oil Co., of Miami Beach, Indiana: \$479,462 to **Putnam & Greene, Inc.**, of Fort Wayne; \$314,061 to **R. Daoust**, of Defiance, Ohio; \$226,193 to **Grace Construction & Supply Co.**, of Fort Wayne, New Jersey: \$511,638 to **Francis A. Canuso & Son**, of Philadelphia, Pa. New York: \$454,576 to **John Bellardino Inc.**, of Seneca Falls; \$712,328 to **Bero Engineering & Construction Corp.**, of North Tonawanda; \$373,301 to **Frank Stento & Son**, of Binghamton, Ohio; \$1,216,816 to **Carl Myers and Pierce Construction Co.**, of Toledo; \$245,382 to **Ralph R. Heffner & Sons**, of Celina, Pennsylvania; \$895,502 to **Central Pennsylvania Quarry Stripping & Construction Co.**, of Hazleton; \$913,395 to **F. D. Kessler, Inc.**, of Northumberland, Texas; \$226,128 to **Thomas & Ratchiff**, of Rogers; \$249,801 to **Austin Road Co.**, of Dallas, Virginia: \$242,824 to **C. D. & C. P. Fugate**, of Wise, Washington: \$306,701 to **Northwest Construction Co.**, of Seattle; \$263,889 to **Peter Kiewit Sons Co.**, of Omaha, Neb.

Successful bidder for contract to build Beach Thorofare Bridge approaches in New Jersey, was **O. Hansen**, of Ventnor, with low bid of \$1,167,013. **Harris Structural Steel Co.**, of New York, was awarded contract for bridge superstructure over Potomac River between Maryland and Virginia, at cost of \$735,000.

FEBRUARY, 1942

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# Construction Methods

A Pictorial Survey of Current Practice, Equipment and Materials

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PUBLICATION

## The HOW of it

For the benefit of readers concerned with the practical application of method or equipment the following references are to articles or illustrations in this issue that tell:

- How **FLAT BACK SLOPES** and streamlined ditches were built on Wisconsin highway. — p. 39
- How **HIGHWAYS SERVED ARMY** during large-scale maneuvers in South. — p. 42
- How **FLOATING BRIDGE** was built across river to carry troops and mechanized equipment during Army maneuvers. — p. 43
- How **PERFORATED STEEL PLANKS** were laid on sandy soil to form temporary airplane runways. — p. 45
- How **AIR BASE PAVING** with concrete was done with truck-mixers and screw-type spreaders. — p. 46
- How **BITUMINOUS PAVEMENT** of four types was laid at Fort Leonard Wood. — p. 47
- How **TAMPING-LEVELING FINISHER** prepared asphaltic surface on parking area. — p. 48
- How **MORE POWER** can be obtained from tractors. — p. 50
- How **TANDEM HOOK-UP** of two scrapers behind tractor increased yardage moved. — p. 51
- How **AERATING ADMIXTURE** produced lighter, leaner, drier concrete for highway paving. — p. 54
- How **SCREW-SPREADER** distributed concrete for highway construction. — p. 55
- How **WHITE CEMENT FLOOR** was laid to reflect light for aircraft assembly in bomber plant. — p. 58
- How **ROTATING TROWEL BLADES** on gasoline-powered finishing machine prepared factory floor. — p. 59
- How **WEIGHING EQUIPMENT** speeded up paving-mix plant production. — p. 59
- How **SHOP TRUCK** was equipped to repair Army equipment in field. — p. 60
- How **FALSE BOTTOM** improved discharge of end-dump truck. — p. 61
- How **HEAVY GRADING** produced deep cuts for express highway extension. — p. 62
- How **LIGHT REFLECTING SURFACES** of white cement were applied to median strips of highway. — p. 64
- How **TAR CONCRETE** for stabilized road base was produced at central plant. — p. 68
- How **PNEUMATIC-TIRED ROLLER** equipped with nine wheels compacted stabilized base in 3-in. layers. — p. 72
- How **ACCESS ROAD** to Army camp was revamped to serve defense traffic. — p. 73

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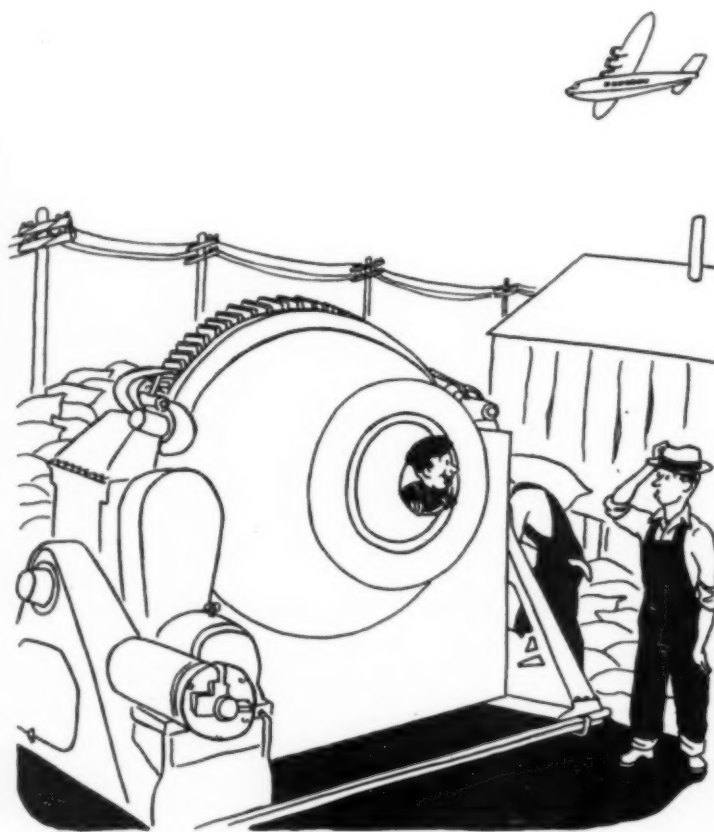
**THE JOB JESTER**  
CARTOONS DRAWN FOR CONSTRUCTION METHODS



"He always finishes up with the dipper in that position so his wife can put the cat out for the night."



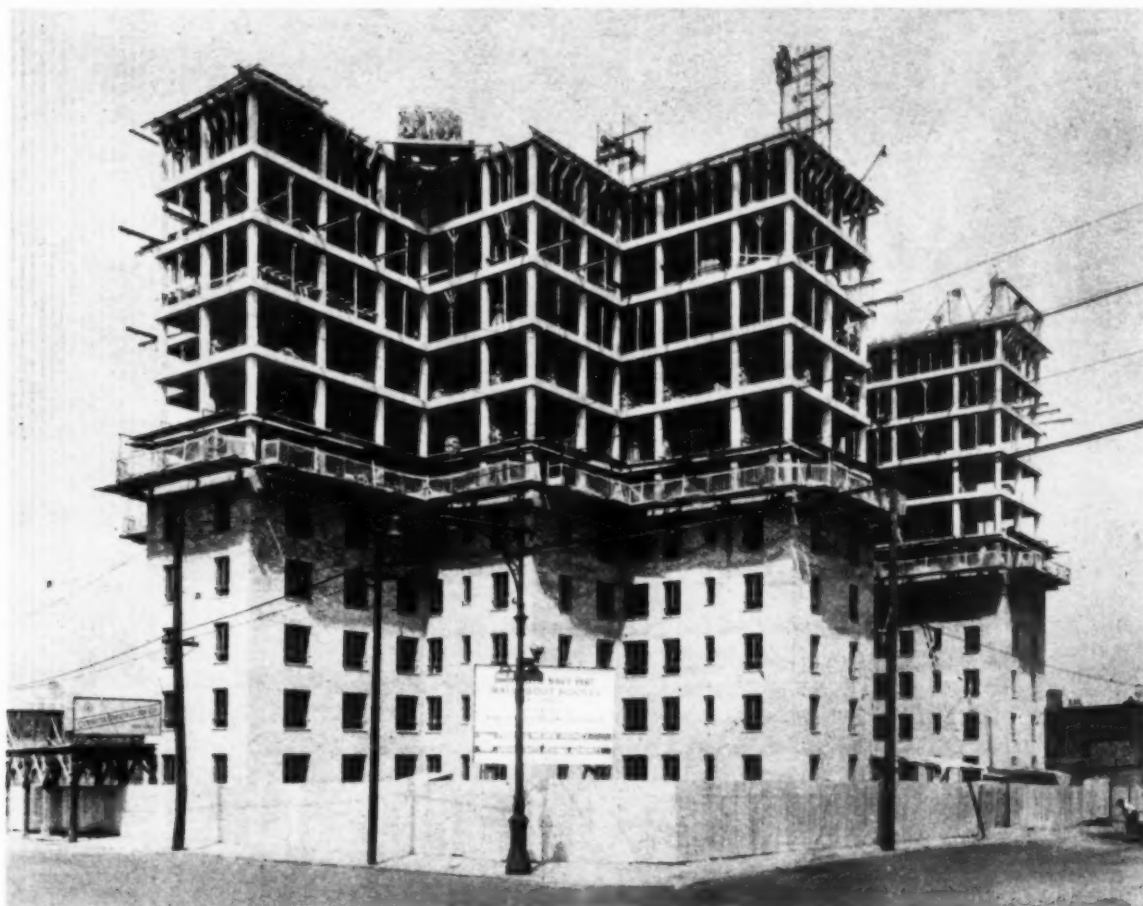
"O.K. Buddy... here's your order of ice cream."



"Look Ed... bomb shelter!"



## CONCRETED IN 37 WORKING DAYS



### HIGH-SPEED WITH 'INCOR' ON THIS 13-STORY NAVY HOUSING PROJECT



QUALITY PAYS... INSIST ON  
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THIS 13-story reinforced-concrete apartment building, 11,500 sq. ft. per floor, was erected in 37 working days—2 floors a week. Noteworthy speed on New York City's first defense housing project, for enlisted Navy personnel, near Brooklyn Navy Yard. Outstanding value, too—completed fire-safe structure, ready for occupancy, at about 40¢ a cu. ft.

Using 'Incor' 24-Hour Cement, ready-mixed concrete was poured at night, avoiding traffic congestion. Next morning, carpenters were on the freshly-placed floors. With 125 columns per floor, erection was by no means simple. *But good job planning with 'Incor' saved 2 work weeks.* 'Incor's excellent workability produced clean surfaces for exposed ceilings and floors.

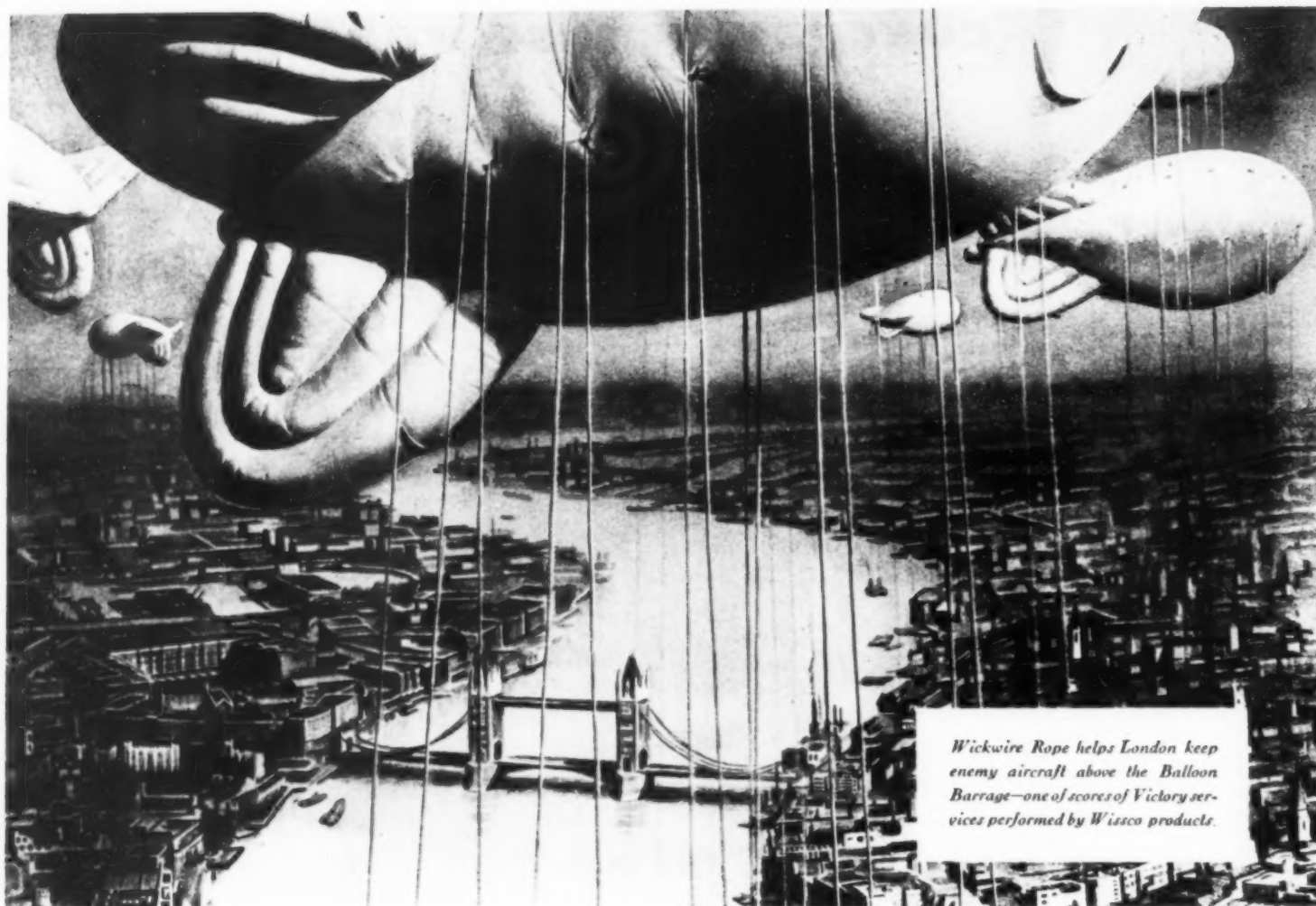
Get speed like this the year around... use 'Incor'\* this Winter... save 2 to 3 days' heat protection on each pour... cut form costs in half... high speed with economy. Write for copy of "Cold-Weather Concreting." Lone Star Cement Corporation, Room 2262, 342 Madison Avenue, New York.

\*Reg. U. S. Pat. Off.

Brooklyn Navy Yard Wallabout Houses: New York City Housing Authority, for U. S. Housing Authority. Architect: Hohauser, Vollmer & Wefferling, New York. Contractor: Corbetta Construction Co., New York.

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Here is a vital message written in steel upon the skies over London . . . where a single order for 587 miles of Wickwire Rope now adds its bit in protecting a great city from dive bombers.

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The message is: **VICTORY NEEDS STEEL!** Victory needs night and day all-out efficiency in every industrial operation. Wire rope that fails too soon wastes steel. The time wasted replacing it is a red stop light on Victory.

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Hopper dimensions alone don't tell the whole story, because Bottom-Dump EUCLIDS are designed to both *carry* and *trail* the pay load . . . a large part of the load is utilized by the tractor for positive traction over soft fills and steep haul roads. Euclid design reduces non-productive equipment weight and results in bigger pay loads each delivery.

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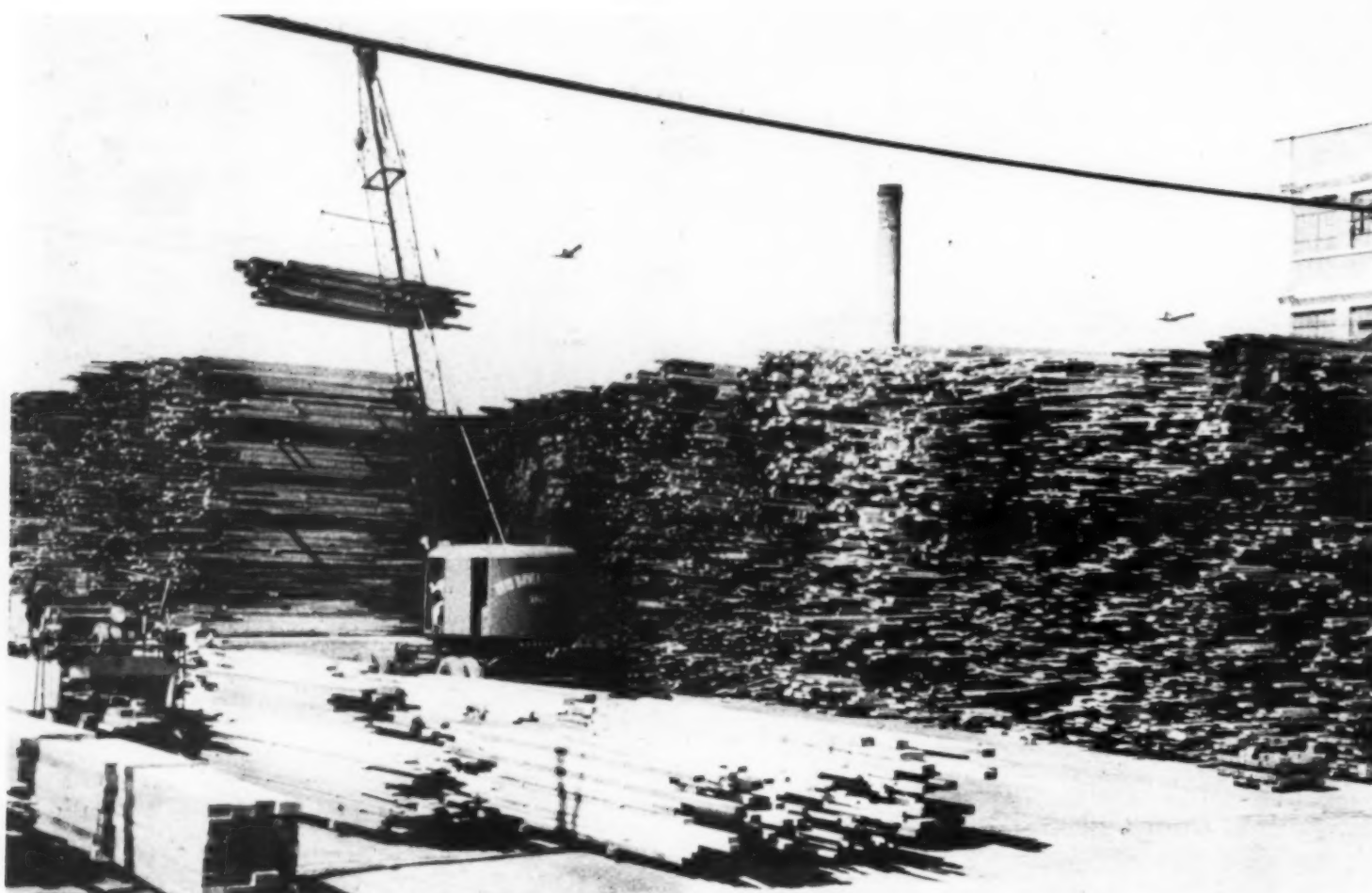
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SELF-POWERED  
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For EARTH, ROCK, COAL, ORE  
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SUPERCRANE handling lumber for New Haven Terminal, Inc. The SUPERCRANE moves quietly, smoothly and efficiently without damage to concrete, planking or any other surface.

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The GENERAL SUPERCRANE is a necessity on any job that requires more work per day, more speed on the job, and lower operating costs.

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HERCULES  
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6 to 12 Tons  
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## GENERAL

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Heil Hi-Speed Tractor Scoops get big loads quickly. Push-loaded by a 100 H.P. Convlar Tractor, this rubber tired unit picks up heaped 15' yard loads in 40 to 50 seconds.

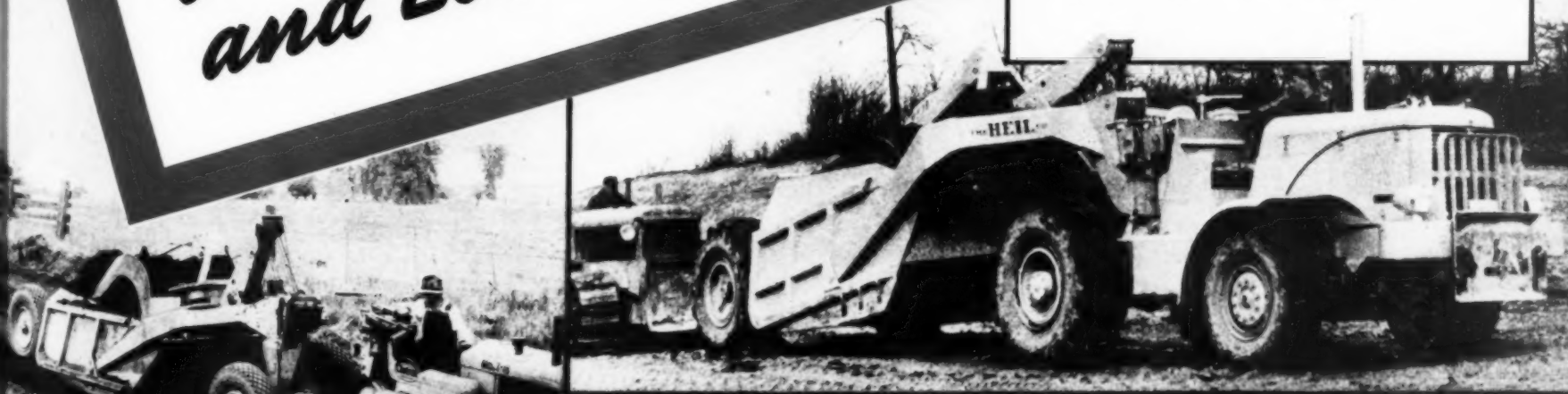
Depend on **HEIL**  
**HI-SPEED**  
**CABLE SCOOPS**  
for Bigger Yardage  
and Lower Costs!

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Heil engineers, backed by years of dirtmoving experience, have provided Heil Hi-Speed Units with every possible feature for safe, economical operation. Compare these working advantages: Scientific weight distribution . . . Effortless hydraulic power steering . . . Short turning radius . . . Individual and unit-controlled air brakes . . . High ground clearance . . . Comfortable spring supported driver's seat . . . 150 H.P. Cummins Diesel Engine . . . Fluid coupling drive . . . Fast, positive Heil Cable Control of Scoop operations.

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Above: Heil Hi-Speed Units have hauling speeds up to 20 M. P. H., depending on road and grade conditions. Fluid coupling drive makes for easy shifting and fast acceleration.

Left: Six-yard Heil Twin-Cable Scoop and Model DD Cletrac Tractor building road bed for Northern Pacific Railroad.

Right: Positive down pressure on the blade speeds up operation of this Model HT 60 Heil Trailbuilder and Model DD Cletrac, side casting shale over embankment.



# Speeding Victory

## Barber

THESE machines are the products of free enterprise, developed in times of peace for normal functions. They are typical of the many ingenious results of the open competition of a democratic system. Now these very machines are working to defend the system that made them possible.

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**B-G FINISHER** laying runways for Martin Bomber Assembly Plant Alameda, Fort Crocker, Nebraska. The B-G Finisher receives the asphalt mix from trucks, evenly spreads it, compacts it to a uniform density, and automatically lays a level surface even over an irregular sub-base.



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**AURORA, ILLINOIS, U. S. A.**

**B-G BITUMINOUS CENTRAL PLANT**

This plant is a complete unit for the production of bituminous material. It is used for the production of bituminous material for the construction of roads, bridges, and other structures. The plant is capable of producing up to 100 tons of bituminous material per day. It is a complete unit, including all the necessary machinery and equipment for the production of bituminous material.



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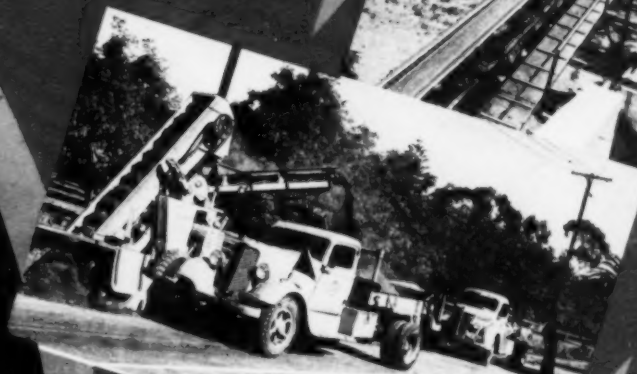
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These conveyors are being used for conveying sand and gravel in a central application and storing the various sizes.



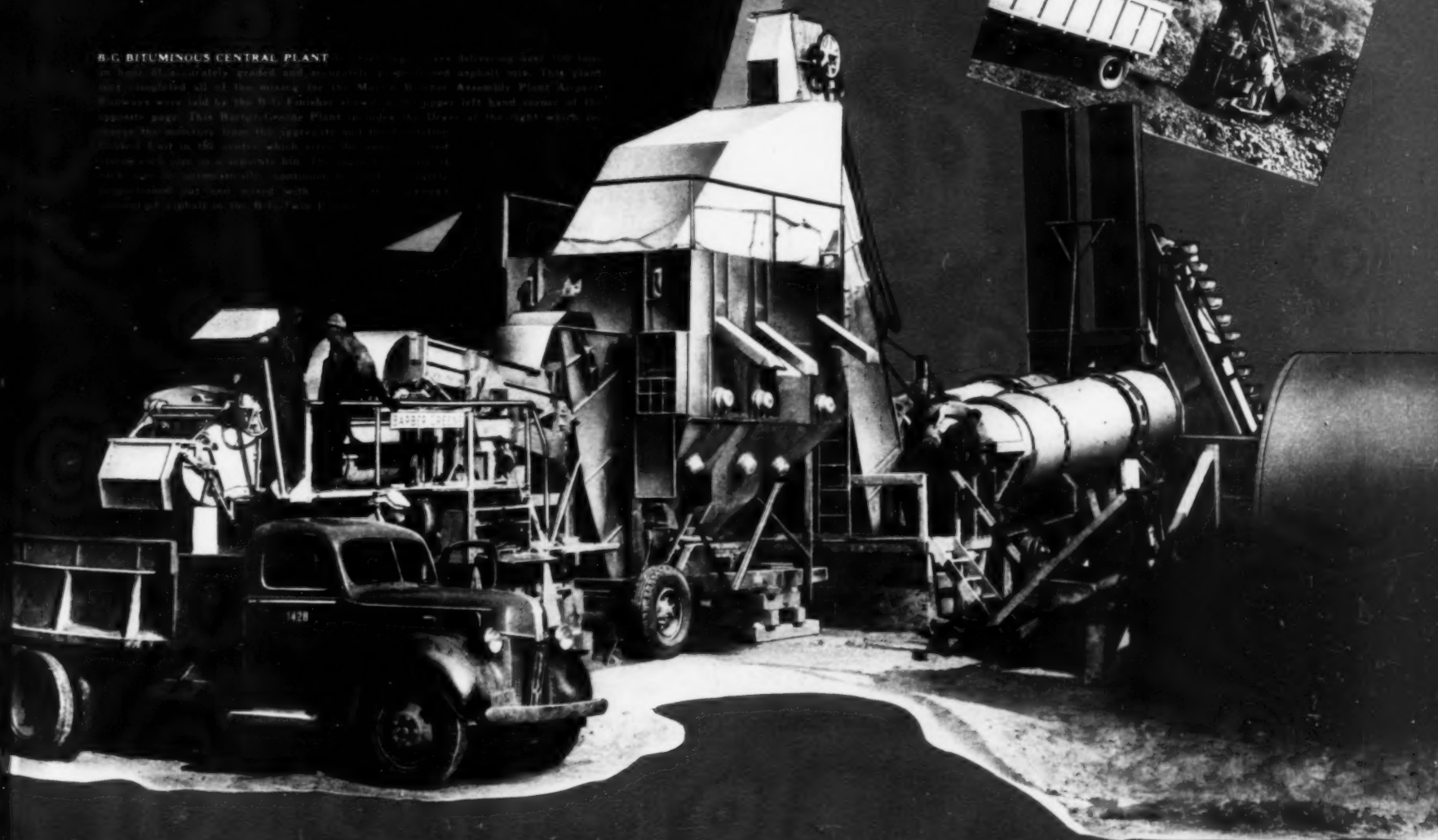
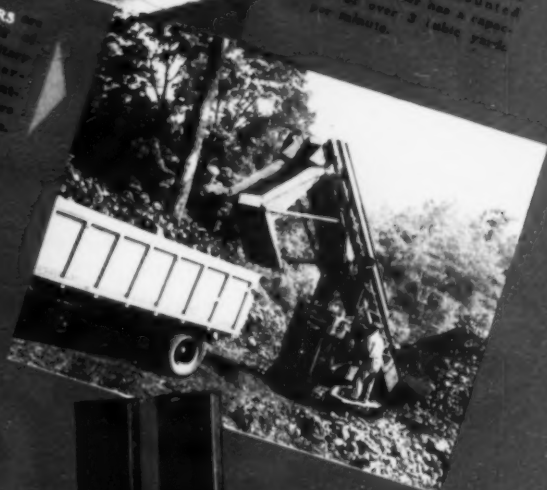
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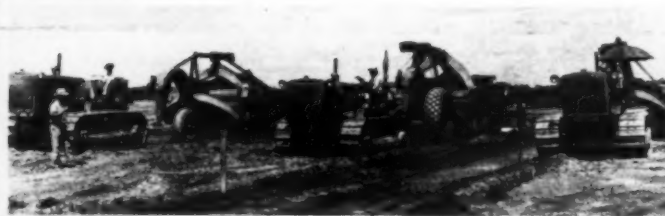
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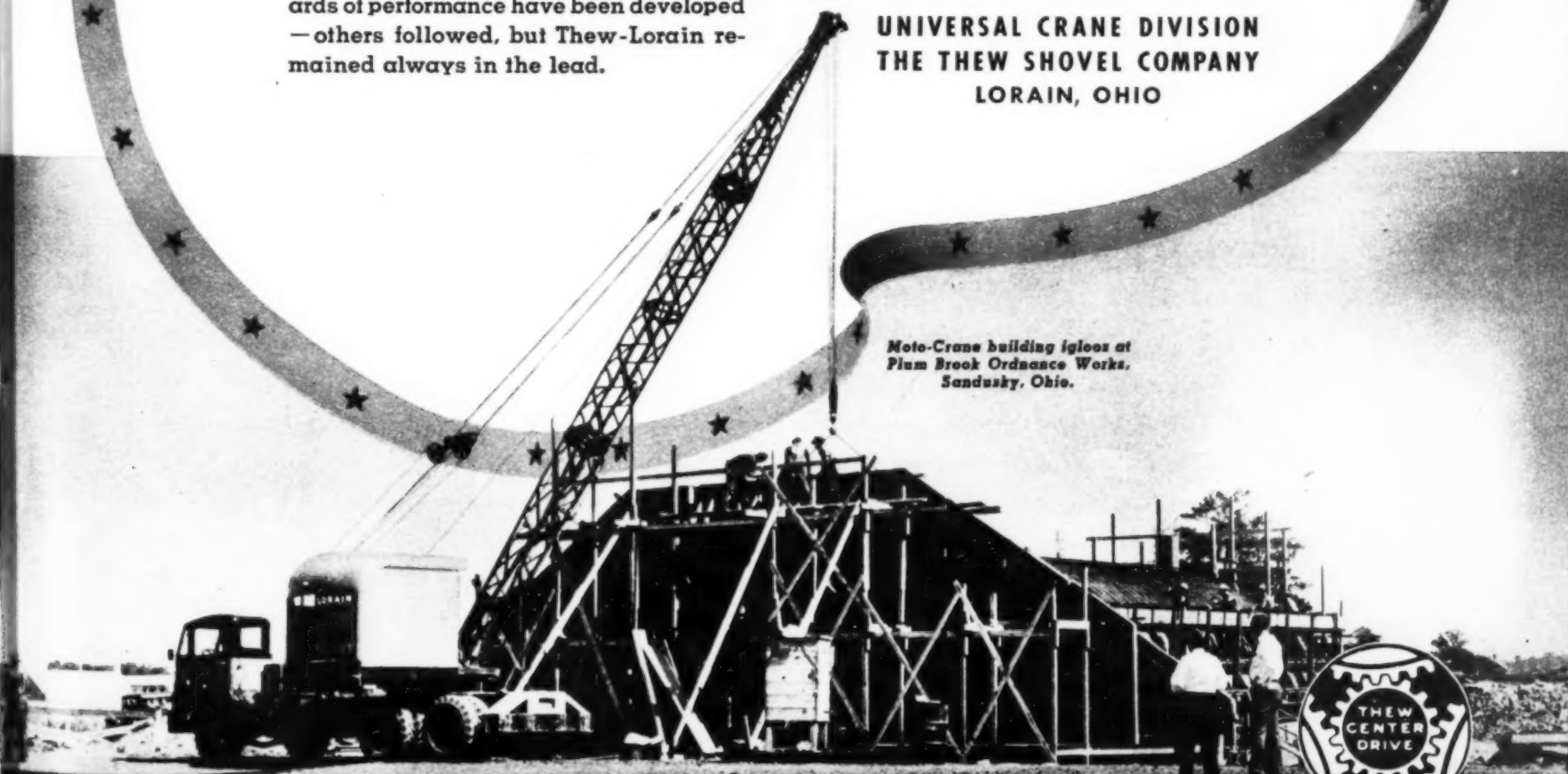
From that date on, Thew-Lorain engineers have never ceased their search for ways of increasing the effectiveness of portable rubber-tired cranes. Down through the peacetime years, capacities have gone up, new designs have been developed, new uses and higher standards of performance have been developed — others followed, but Thew-Lorain remained always in the lead.

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**UNIVERSAL CRANE DIVISION  
THE THEW SHOVEL COMPANY  
LORAIN, OHIO**

Moto-Crane building igloos at Plum Brook Ordnance Works, Sandusky, Ohio.



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WORKING TODAY ON THE GROUNDWORK FOR THE AMERICA OF TOMORROW

# *A.M. prevents waste*

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America is now "all out" for VICTORY. Important Defense jobs and vital industries must not be delayed. Trucks, trailers, mobile shovel-cranes (that move under their own power on the highways, from job to job and on the job, saving precious time and cutting costs) are vital to victory, too. It's every owner's and operator's duty to keep his equipment in shape — *to keep it rolling!*

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# 60,000 YARDS MOVED USING ONLY 250 FEET OF TOURNAROEPE

## PATTERSON BROS. SAY LOW YARDAGE COSTS DUE TO MODERN DESIGN OF LeTOURNEAU CARRYALLS PLUS RIGHT ROPE

Like long-time fleet users, Patterson Bros., you can get big yardages and low costs with LeTourneau equipment. Let these modern, job-proved design features cut costs for you:

Sliding block sheaves on top springspipe and dead-ended apron and tailgate cables that operate out of the dirt to reduce wear.

High bowl sides and big apron that increase capacity and hold in all the dirt you dig.

Arched "A" frame that strengthens construction and gives you easier unloading.

Couple this modern profit-making design with preformed Tournaroepe, manufactured by LeTourneau especially for cable-operated, tractor-drawn equipment, and you get "lowest net cost per yard". Try it — see for yourself NOW.

Here's a typical Patterson Brothers load.



# LETOURNEAU

PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

Cable Address: BOBLETORNO

CARRYALL SCRAPERS, ANGLEDZERS, BULLDOZERS, ROOTERS, POWER CONTROL UNITS, TRACTOR CRANES, PUSHDOZERS, SHEEP'S FOOT ROLLERS, TOURNAPULLS, TOURNATRAILERS, TOURNACRANES.

\*Name Reg. U. S. Pat. Off.

December 18, 1941

R. G. LeTourneau, Inc.  
Stockton, California

Gentlemen:

We have just finished 60,000 yards of grading for a spur track for the Western Pacific Railroad Co. near Stockton and thought that you would be interested in the details concerning it.

We used to complete this job three "Caterpillar" D-8 Tractors, two LeTourneau Model "W" CARRYALLS and one LeTourneau XD-9 Bulldozer. Material moved was a wet, heavy, sticky adobe; and hauls were from 600 to 4000 ft. one way.

Before starting we equipped the Bulldozer with TOURNAROEPE and the two CARRYALLS with a 500-ft. reel of TOURNAROEPE on each.

The Scrapers were pusher loaded and, believe me, enormous loads were packed into them. In spite, however, of the large loads of heavy, sticky material, our cable cost for the movement of the entire 60,000 yards was so low as to be almost startling. For all three outfits we absolutely did not use over 250 ft. of cable on the entire job, and anybody who has ever moved any of this type of material knows that this is a phenomenal record.

The low cable cost is, in our opinion, due to two things: First, the high quality of TOURNAROEPE; and second, the clearance of the arched "A" Frame on the Scrapers, which permitted the material to be ejected freely, and the fact that the rigid bowl construction of the Model "W" CARRYALL permitted the tailgate to travel back and forth freely without binding at all times.

We like the Model "W" CARRYALL because it is virtually trouble-free and makes us money.

We can give you the average production of each unit per hour, but we don't believe that these figures will be of much value because of the various haul lengths of the yardage involved and the peculiar haul conditions on this particular job.

Sincerely yours,  
PATTERSON BROTHERS

By *Ray Patterson*



Preformed Tournaroepe is made in 5 sizes — 3/8", 1/2", 5/8", 3/4" and 7/8". Order from your LeTourneau "Caterpillar" dealer.



# Busy Signal AT MURRAY HILL



One wing of the Bell Telephone Laboratories Bldg., Murray Hill, N. J.  
Contractor: John Lowry, Inc., N. Y. C.;  
Sub-Contractor on Concrete: George Peterson, Inc., Harrison, N. J. Architect: Voorhees, Walker, Foley, and Smith, N. Y. C.

**By putting in a call for Atlas High-Early cement, contractor cut time for concrete work 33%, and slashed protection, curing, form, salamander, and tarpaulin costs.**

**UNFORESEEN DELAYS** prevented completion of the concrete work on this building during the summer. To speed construction economically during cold weather, it was decided to switch from Atlas portland cement to Atlas High-Early cement.

Did it pay? Here's what the contractor reported:

**TIME SAVED** on each placement of concrete due to earlier stripping of forms amounted to 2 or 3 days, thus completion of concrete work was speeded at least 33%.

**FORM COSTS CUT**—High-speed construction was essential. If normal portland cement had been used and the same time schedule for placing concrete followed,

another 20,000 ft. of lumber and another 20,000 ft. of plywood would have been required for forms.

#### **PROTECTION AND CURING COSTS CUT**

Depending on the temperature, 2 or 3 days were saved in protecting and curing each placement of concrete. This resulted in a large saving in fuel and labor costs, for as many as 40 salamanders were operating at one time. Further, more salamanders would have been necessary with normal portland cement as it would have been impossible to release salamanders for new work as quickly.

Also, \$5,000 in tarpaulins were used to inclose the structure. Another \$1,000 in tarpaulins would have been necessary if



normal portland cement had been used.

**TEMPERATURES**—This speed and economy were realized in winter weather. There were only 4 days in two months when temperatures did not fall below freezing.

Consider Atlas High-Early cement on your next job. Universal Atlas Cement Company (United States Steel Corp. Subsidiary), Chrysler Building, New York City.

**OFFICES:** New York, Chicago, Phila., Boston, Albany, Pittsburgh, Cleveland, Minneapolis, Duluth, St. Louis, Kansas City, Des Moines, Birmingham, Waco.

CM-H-36

## ATLAS HIGH-EARLY CEMENT

A UNIVERSAL ATLAS PRODUCT







34-E Single Drum MultiFoote Paver on large military airport runway construction.

Adnun Black Top Paver putting down 200 ft. runways on huge airport expansion.

27-E MultiFoote with 64 ft. tower for general airport construction purposes.

27-E Inclined Boom Paver—a flexible unit for any airport construction job.



**THE FOOTE COMPANY, INC.**  
Nunda, New York

**F**OR speed, accuracy, economy and all-around versatility, you can't beat Adnun Pavers for airport runway and apron paving. They'll handle any black top mix, hot or cold as well as rock and slag. Black top output is 1000 tons and more per day. Only Adnuns give you Continuous Course Correction that levels out surface irregularities to bowling alley smoothness. And, Adnun-laid pavement is highly skid resistant—no slippery, fatty surfaces. They're "tailor-made" to meet airport requirements.

• For concrete runway and apron paving as well as hangar and building construction, MultiFoote Pavers give you a fast, flexible means of getting concrete where you want it in a hurry. Built in single drum 27-E and 34-E sizes, these machines are available with towers or inclined booms. Each has advantages not found in similar equipment. Before you go to work on your next airport or paving job, find out the facts. Write for Adnun and MultiFoote Catalogs today.

**ADNUN** BLACK TOP PAVERS

**MULTIFOOTE** CONCRETE PAVERS

# THE "Caterpillar" Diesel

AN OUTSTANDING ACHIEVEMENT IN DIESEL DESIGN!

ONE of the great advancements for efficiency, dependability and economy in Diesel power is the "Caterpillar" Diesel fuel system — designed and built by "Caterpillar" for "Caterpillar" Diesel Engines exclusively. And here's why:

- No operating adjustments at all!
- Pre-combustion chamber of exclusive design which enables burning successfully, with clean exhaust, a wide range of fuels — including low-cost No. 3 domestic burner oil — provides efficient burning of fuel at all loads and speeds. (Engine can idle indefinitely without fouling or choking up, then pick up load immediately without faltering.)
- Injection pumps and also injection valves are interchangeable and are

installed without requiring any timing, balancing or other delicate adjustments.

- Injection pumps are individually replaceable.
- Absorbent type fuel filters of exclusive "Caterpillar" design assure positive protection against dirt and grit being carried by fuel to injection pumps and injection valves.
- Long life — the result of correct design, precision manufacture and highest quality materials.

No other Diesel fuel system is exactly like it! It is one of the many reasons why "Caterpillar" Diesel Engines and Electric Sets are widely preferred — and gaining further popularity at a rapid rate — among builders and owners of powered contracting equipment.

"Caterpillar" Diesel power has been factory-engineered into leading makes of engine-driven equipment. When ordering factory-powered equipment, specify "Caterpillar" Diesel.

**CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS**

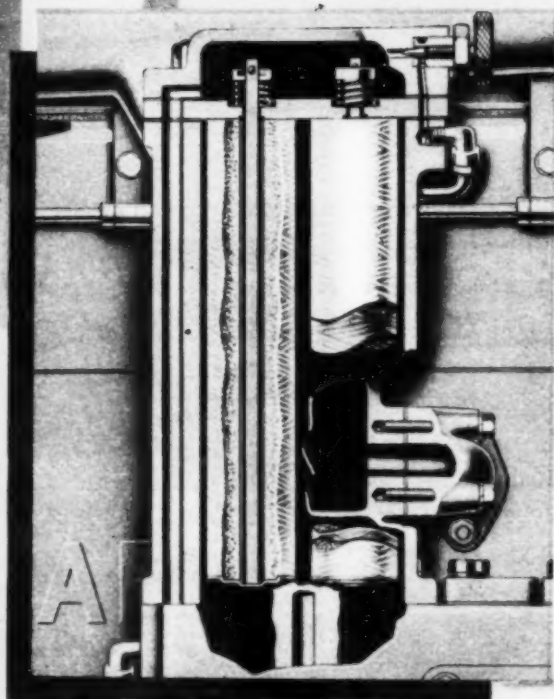
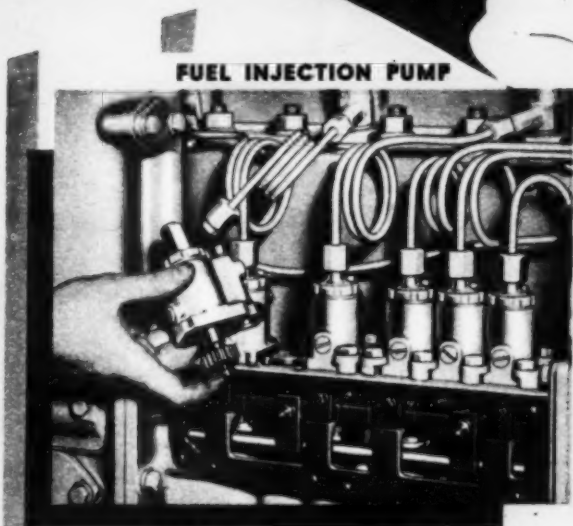
**FOR VICTORY**—Our armed forces have first call on "Caterpillar" production. We thank customers who have suffered delivery delays by giving clear right-of-way to our Victory efforts.

# CATERPILLAR

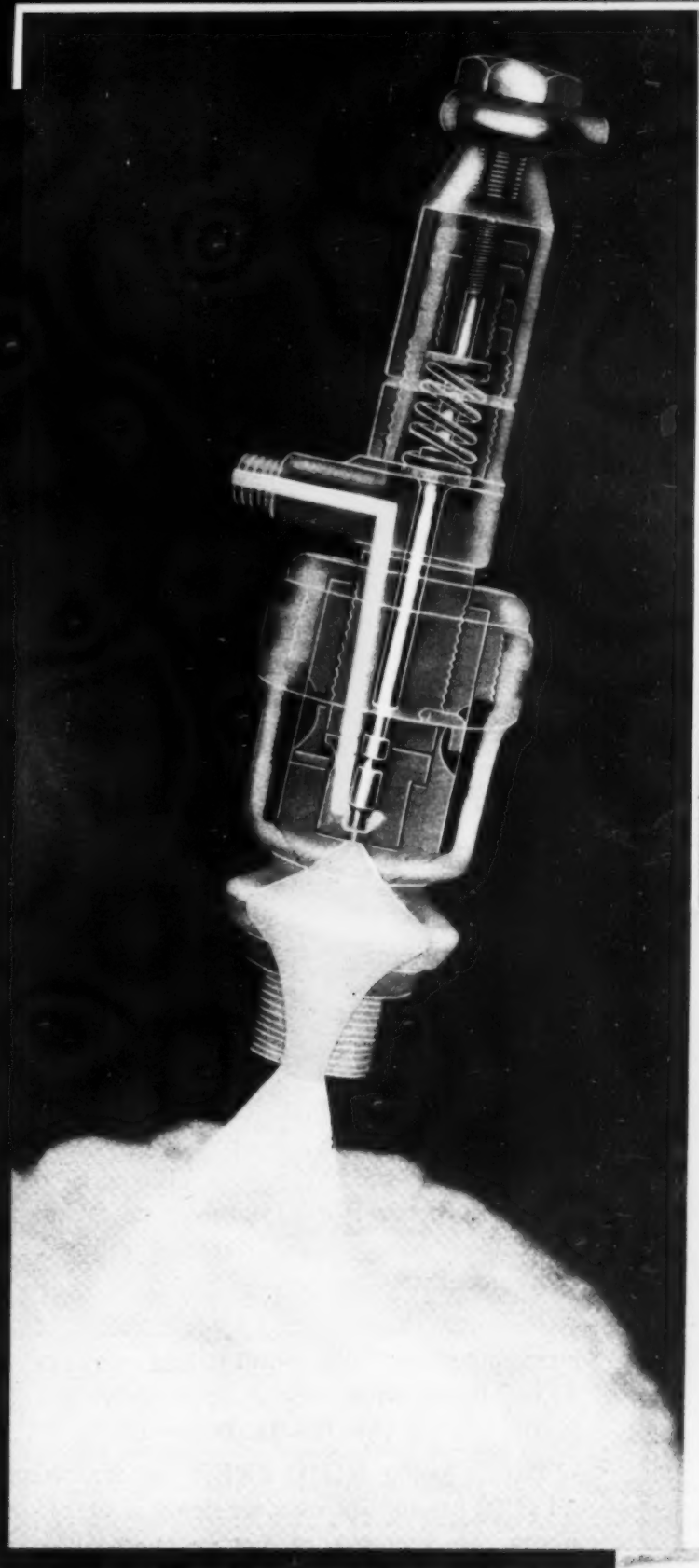
REG. U.S. PAT. OFF.  
ENGINES AND ELECTRIC SETS • TRACK-TYPE AND WHEEL TRACTORS



# Fuel System



FUEL FILTER



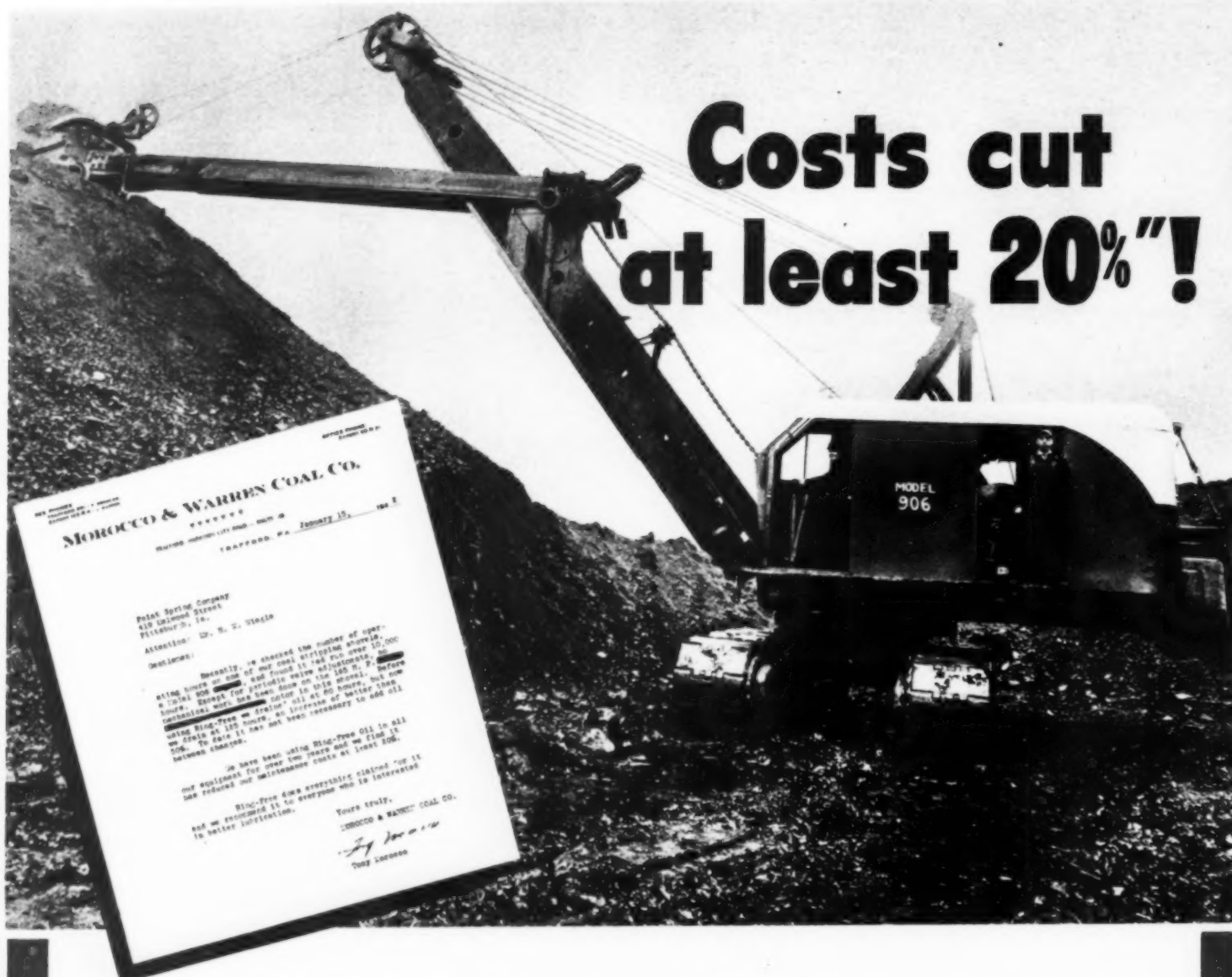
FUEL INJECTION VALVE AND PRE-COMBUSTION CHAMBER

## ***DIESEL***

**ROAD MACHINERY**



Every dot a "Caterpillar" service base. "Caterpillar" products are supported by the most complete and readily available replacement-parts and mechanical service facilities of their kind in the world... always on call and seldom more than a few hours (often only a few minutes) away.



# Costs cut "at least 20%!"

**"WE HAVE** been using RING-FREE in all our equipment for over two years," writes the Morocco & Warren Coal Company of Trafford, Pennsylvania, "and we find it has reduced our maintenance costs at least 20%."

Recently they checked a Model 906 coal stripping shovel and found it had run over 10,000 hours with only periodic valve adjustments on the 165 H. P. motor.

"Before using RING-FREE we drained oil at 80 hours, but now we drain it at 125 hours, an increase of better than 50%. To date it has not been necessary to add oil between changes."

Then Tony Morocco adds:

"RING-FREE does everything claimed for it and we recommend it to anyone who is interested in better lubrication."

RING-FREE is the *only* oil you need for gasoline engines or Diesels. Think *how* that simplifies your lubricating work!

What RING-FREE has done for others it can do for you. Won't you write us?

MACMILLAN PETROLEUM CORP.  
50 West 50th St., New York • 624 So. Michigan Ave., Chicago • 530 West 6th St., Los Angeles

**MACMILLAN**  
**RING-FREE**  
**MOTOR OIL**

Copyright 1942 by  
Macmillan Petroleum Corporation



# SAVE

*up to 40 minutes  
per day per truck!*

Defense construction of all kinds needed in a hurry! This Rex Hi-Discharge Moto-Mixer is one of countless Rex's filling this need on defense projects all over the western hemisphere.



**A** SAVING of 40 minutes per day per truck means a lot these days on any ready-mixed job. And that's what Rex Moto-Mixer users are getting these days, thanks to *quick-as-a-flash end-charging*. Rex has eliminated the time-wasting charging door of ordinary truck mixers and the need for having truck operators leave their cabs during charging operations. This alone saves as much as 5 minutes a batch!

This alone would be reason for standardizing on Rex on

jobs where speed is at a premium—but there are others, too.

For instance, the Rex Hi-Lo mixing action means faster and more thorough mixing; and the handy Rex Quint-Spout makes discharging easier, under all conditions.

You'll get a new slant at what a truck mixer can offer you in the way of speed and economy on today's "high pressure" jobs, if you send for the Rex Hi-Discharge Moto-Mixer Catalog. Just address 1664 W. Bruce St., Milwaukee, Wisconsin.



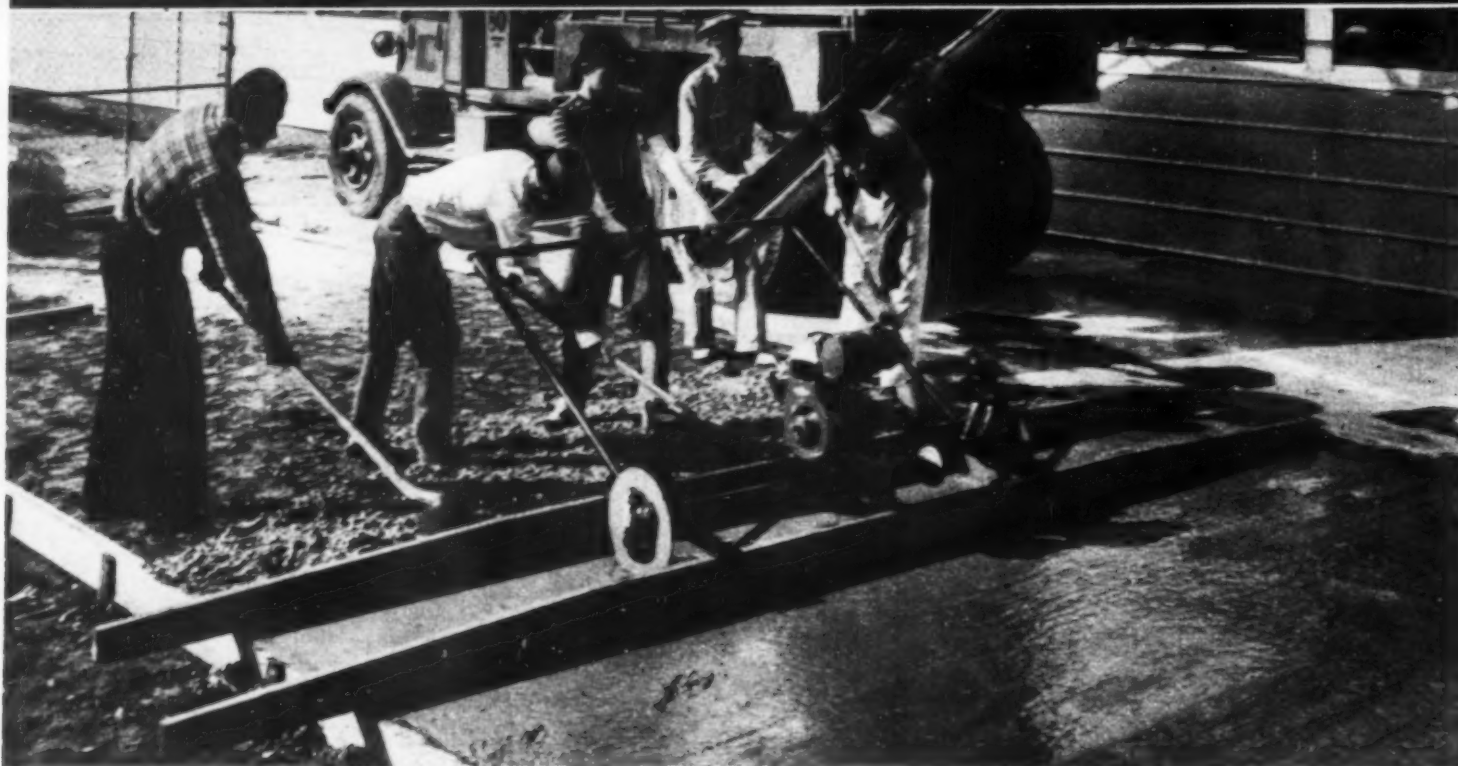
## MOTO-MIXERS

HI-DISCHARGE AND CONVENTIONAL TYPES

C H A I N   B E L T   C O M P A N Y   O F   M I L W A U K E E

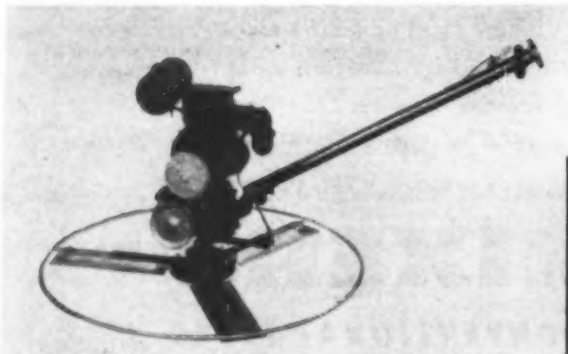
# *To Speed Construction*

## Power Operated Screeds for Concrete Floors



(Above) Detachable rod sticks (screeds) on the WHITEMAN Rodding Machine make 5" strokes transverse to line of travel, are advanced, while moving, by pull of operator. The powerful Wisconsin gasoline engine permits speedy, easy handling of dry, low-slump concrete by one man.

The WHITEMAN Rodding Machine is made by the manufacturers of the WHITEMAN Finishing Machine (shown below) which is making speed and cost records on large and small concrete floor jobs throughout the country.



**N**OW AVAILABLE for the first time to the building trades are advantages to be had only in the WHITEMAN power driven screeding machine, which is capable of rodding dry, low slump concrete with ease. This portable machine weighs 235 pounds, and is the answer to low cost preparation of floor slabs.

The two rod sticks (screeds) of the WHITEMAN machine ride the headers. Driven by the gasoline engine, the rod sticks make 5" transverse strokes — in opposite directions. During the power-driven transverse movement, a steady pull forward by the operator provides a uniform rate of advance. This leaves a pour that has been simultaneously levelled and vibrated — ready, when sufficiently set, for final finish by the WHITEMAN Floor Finishing Machine.

The WHITEMAN Rodding Machine can multiply the capacity of your concrete floor crews, giving you speed and cost savings.

"We have not been able to find the maximum capacity of the WHITEMAN Rodding Machine," says an experienced Southern California contractor. "We have had it on various jobs using ready-mix concrete, but have never been able to deliver concrete fast enough to supply its full capacity."

"It is easy to handle four yards of low-slump concrete in 5 minutes."

If you want to lay more and better concrete floors, faster and at a lower cost, write or wire today for details on this proved machine.

### WHITEMAN MANUFACTURING CO.

3249 CASITAS AVE.  
LOS ANGELES, CALIFORNIA



# Here's Your Answer to the Need for *Speed and Dependability*



**T**HERE has never been a greater need for action! Airports, ordnance works, military roads, plane and war material plants must be finished and put into service at the earliest possible moment. Every man and tool must be efficient; there is no time for costly delays.

So, it is fortunate that, during the past four years when there was no emergency, LaPlant-Choate designed, developed and proved a highspeed, long-haul earth-moving unit . . . the CW-10 "Carrimor" . . . an outfit which moves earth at new low costs and sets new figures in yardage production.

Big earthmovers all over the country are using these CW-10 "Carrimors" singly and in fleets . . . they like their dependability and quality; they like their ability to load, transport and spread quickly and uniformly, and the many other features which have made this outfit so outstanding.

Put CW-10 "Carrimor" Scrapers on your job and make new earth-moving records!

## LAPLANT-CHOATE

Factory & Home Office  
Cedar Rapids, Iowa

*Manufacturing Co. INC.*

Pacific Coast Office  
San Leandro, Cal.

**EARTH MOVING - LAND CLEARING - SNOW REMOVAL EQUIPMENT**



### WAR PRODUCTION

tolerates no slow-downs. Don't allow inadequate lubrication to reduce productive machine hours. For **CONSTRUCTION MACHINERY** there are . . .

### . . . SINCLAIR SPECIALIZED OILS and GREASES

to meet the punishment of stepped-up productive hours and keep equipment delivering top output. For lubrication that cuts shop costs try the Sinclair brands. Full information, or lubrication counsel, available from nearest Sinclair office or Sinclair Refining Company, 630 Fifth Avenue, New York, N. Y.

Write for "The Service Factor"—a free publication devoted to the solution of lubricating problems.



**HUGE MARION SHOVEL** operated by Northern Illinois Coal Corporation, Wilmington, Ill. Sinclair lubricants used.

# SINCLAIR LUBRICANTS-FUELS

SINCLAIR REFINING COMPANY (Inc.)

2540 WEST CERMAK ROAD  
CHICAGO

10 WEST 51ST STREET  
NEW YORK CITY

RIALTO BLDG.  
KANSAS CITY

573 WEST PEACHTREE STREET  
ATLANTA

FAIR BUILDING  
FT. WORTH





BE A STEP AHEAD  
WITH  
**P & H**

**NO OTHER SHOVEL GIVES YOU**

**TRUE TRACTOR TYPE CRAWLERS  
LOW PRESSURE HYDRAULIC CONTROL  
ROLLED ALLOY STEEL  
ALL WELDED CONSTRUCTION**

*The many modern P&H features will protect  
you against obsolescence for years to come.*

General Offices: 4494 West National Avenue, Milwaukee, Wis.

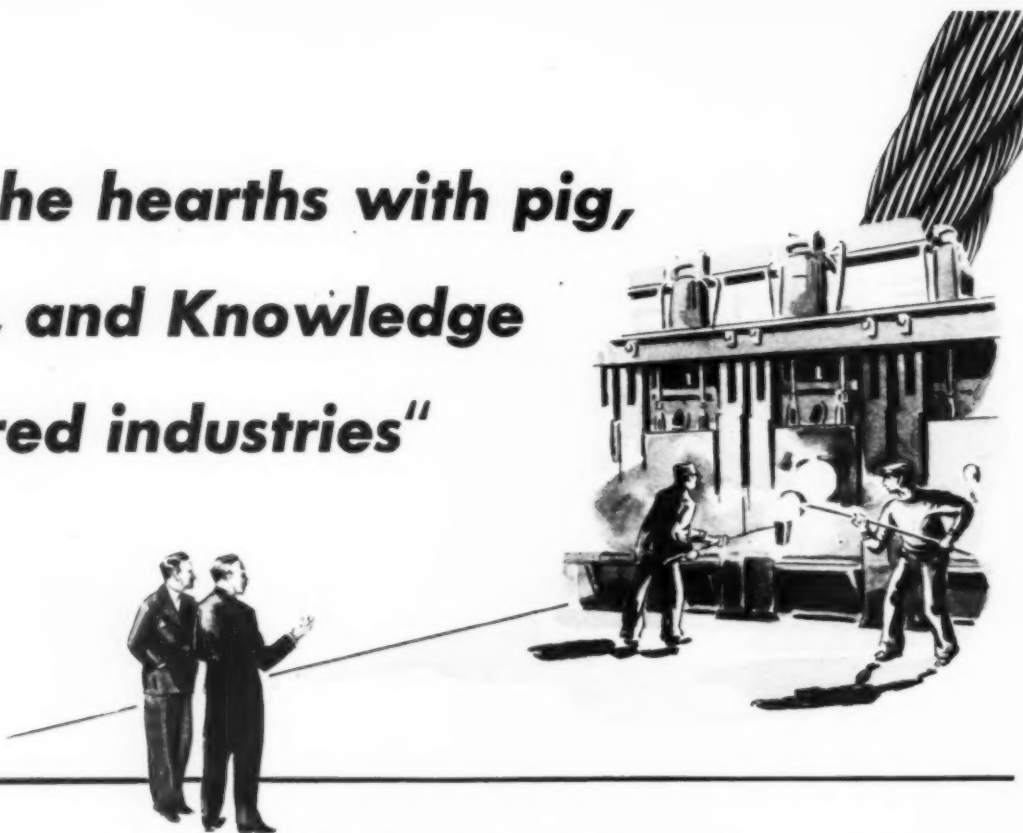
**HARNISCHFEGER**  
CORPORATION

EXCAVATORS • ELECTRIC CRANES • ARC WELDERS



HOISTS • WELDING ELECTRODES • MOTORS

**"You charge the hearths with pig,  
and scrap, and Knowledge  
of a hundred industries"**



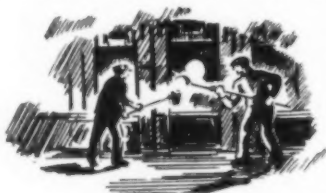
For this is Roebling "Blue Center" Steel  
"It's fired for many hours before it's ready to pour, and during the better part of two shifts you put into it many things. Some are ingredients that anyone can use in open hearth steel. And some are not . . .

As the empty hearth begins to glow, you lay your silica bottom. You're making "Blue Center" steel, and it calls for purer raw materials. Good pig, selected scrap and plate.



Long daytime hours and nighttime hours of firing, and at their end, the one right moment when the steel is ready to pour. When is that moment? Shake hands with Andrew Fors, one of those whose eyes since 1906 have been an ingredient of Roebling ingots. Now he's passing his melter's skill on to his son at Roebling. Yes, skilled eyes and

eyes alone can tell when the melt is ready. There is no other way . . .



There goes another strange ingredient in. That melter's taken out a sample, to put back something bigger... Knowledge, from the Roebling laboratory and field. Knowledge of a hundred industries, and steel that will exactly meet the needs of each. Every melt's a special melt — right for aircraft control cord, or elevator cable, or factory cranes . . . right for tugboat hawsers, or mine hoists, or oil well drilling lines.



That's the only way you can make the steel we use in "Blue Center" Wire Rope. You start right with the way the ingot's made . . . to meet its job right from the first. We call it "tailored steel", and it's worthy of the Roebling Trade Mark, from the time it leaves the open hearths . . ."



Knowledge of men in the Roebling mills, of Roebling men in the field . . . Roebling process control and engineering and research . . . there's many a hidden ingredient in "Blue Center" Wire Rope. Reasons why it lives so long, and never fails to deliver its full measure of service.

JOHN A. ROEBLING'S SONS COMPANY  
TRENTON, NEW JERSEY  
Branches in Principal Cities



THAT'S THE ONLY WAY TO MAKE

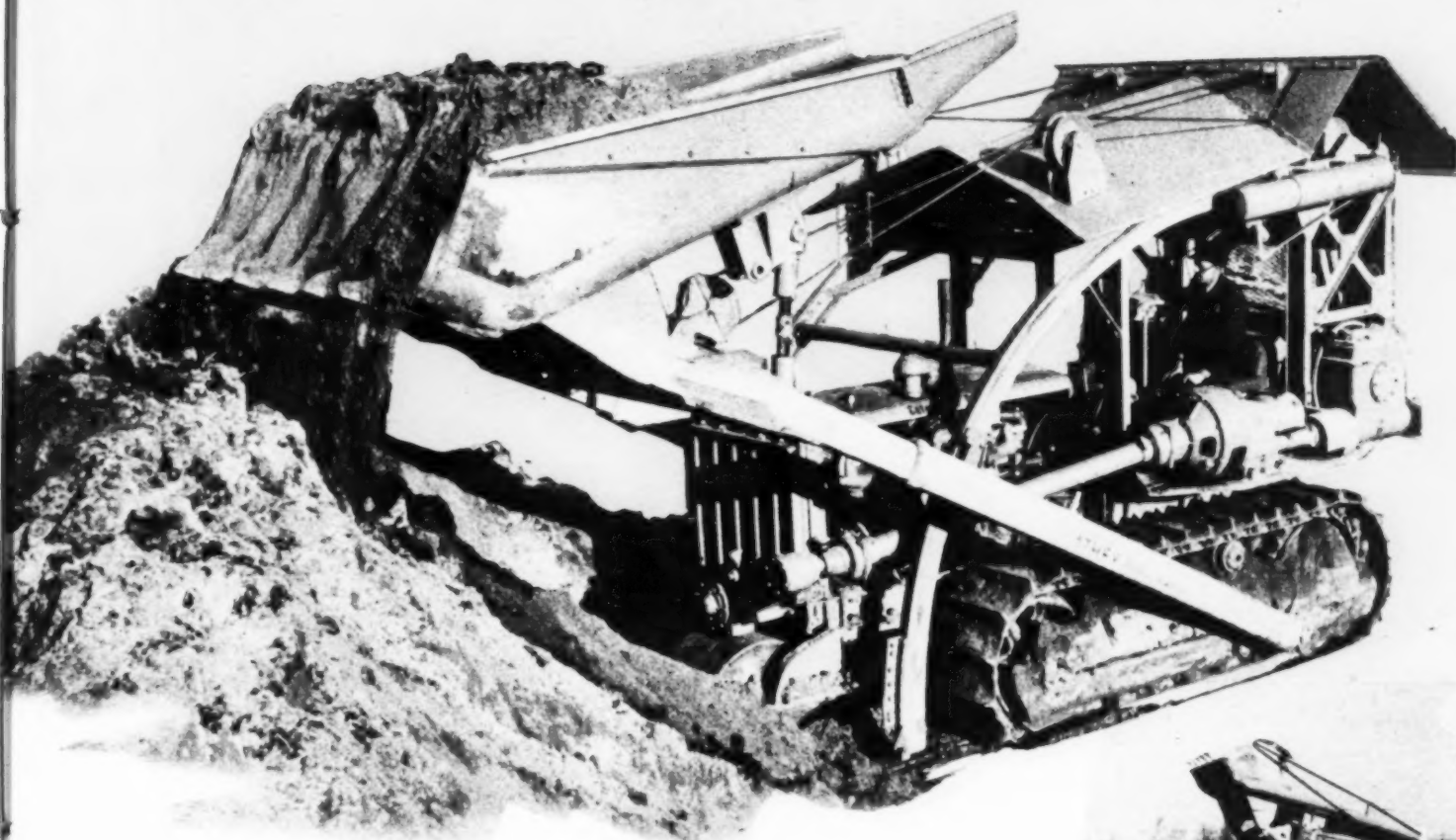
**ROEBLING**

*"Blue Center"*

**STEEL WIRE ROPE**  
PREFORMED OR NON-PREFORMED



# Now . . . A Big-Capacity Athey MobiLoader to Match BIG SHOVEL PRODUCTION



**DIGS AT  
THE FRONT**

## Substantial Savings in Initial Investment and Operating Costs

To extend the speed and economy of the MobiLoader to a wider range of uses, Athey offers the Model 8 MobiLoader . . . a companion to the job-proved Model W4.

Now, with greatly increased capacities and using the heavy-duty "Caterpillar" D8 Tractor for power, the MobiLoader enters a new field — makes available a mobile, cost-cutting loading tool that provides big output in less time at low cost.

The Athey MobiLoader uses the simple and time-saving method of digging at the front and dumping its load overhead at the rear, thus eliminating turning the tractor around for discharging the load. In that way, the

MobiLoader does the job faster and cheaper, reduces operating expense and tractor wear, enables you to step up your production to more profitable levels.

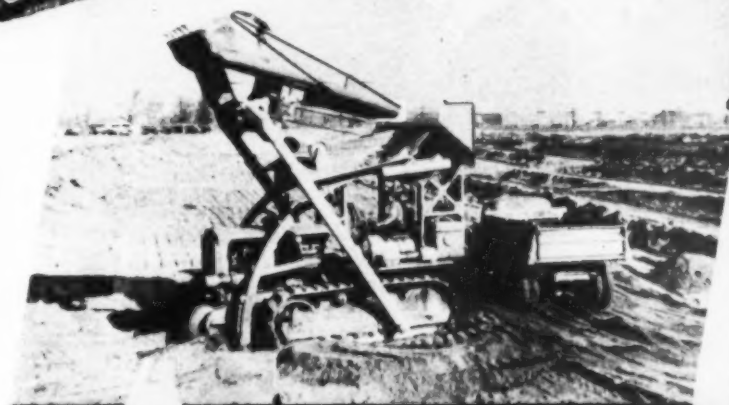
Proved on actual operations for more than two years, the Model 8 MobiLoader has introduced shortcuts in the handling of ore, coal, earth, clay, gravel, crushed stone and all stockpiled materials — has displaced costly and antiquated methods and equipment.

Now's the time to assure utmost efficiency on your defense jobs. Get more facts on this big-capacity, mobile loader. Mail the coupon today for an interesting folder — sent without obligation.

Bucket sizes for Model 8 MobiLoader range from 2.7 to 4 1/4 cubic yards, depending upon type of material. Model W4 MobiLoader capacity is 1 1/4 cubic yards for general excavation and 3 cubic yards for snow removal.

*The Athey line includes Earth and Rock Trailers, Oil Field Trailers and Wagons, Logging Cruiser Wheels, MobiLoaders, Force-Feed Loaders and track-type Trailer equipment for every hauling need.*

# ATHEY



**DUMPS AT  
THE REAR**

Above photos show borrow pit excavation for material to build roads to Michigan bomber plant.



MobiLoader on Mesabi Iron Range saves time and money loading iron ore concentrate into railway cars.

### MAIL COUPON TODAY

Athey Truss Wheel Co.  
5631 W. 65th Street  
Chicago, Illinois

Gentlemen:

Please send me, at no obligation, descriptive folder on the Model 8 MobiLoader.

I am interested in loading \_\_\_\_\_

Signed \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

CM242



## His ear can hear the soundless song of steel

*Who is this "Doctor of Applied Research"? He is the symbol of the spirit of Waugh Laboratories . . . ready to bring you the fruits of his labor . . . to help you profit from some recent, highly important engineering findings in the field of forces, stresses, and vibrations.*

WAUGH LABORATORIES announces the availability of its engineering field service and testing laboratory facilities for stress determination and analysis.

The staff engineers and several prominent consultants of Waugh Laboratories have been actively engaged for many years in the successful application of test methods and instruments to the solution of engineering problems. Their services may be procured on either a *per diem* or contract

basis to assist in, supervise, or conduct field and laboratory tests, or in the design and construction of laboratories.

In collaboration with *Baldwin Southwark Division of The Baldwin Locomotive Works* and *General Electric Company*, Waugh Laboratories makes available a complete line of test instruments and machines for the determination and analysis of stresses, and for the testing of materials. Instruments and machines may be purchased outright or they may be rented from Waugh Laboratories for specific tests. Engineering field service and laboratory facilities will be furnished by Waugh Laboratories.

Information and literature describing specific facilities and their application to individual industries may be obtained by writing Nereus H. Roy, Director, at the address below.



A DIVISION OF WAUGH EQUIPMENT COMPANY • 420 LEXINGTON AVENUE, NEW YORK, N. Y.



# ALL PAVING RECORDS SMASHED

## SOUTH CAROLINA

Show Airport, Sumter, S. C.  
Contractor: Wm. F. Bowe,  
Augusta, Ga.

217 ft. per hour—25 ft.  
width; 8-6-8 inch thick-  
ness.

## CALIFORNIA

Hamilton Field, San Rafael,  
Cal.

Contractor: A. G. Raisch,  
San Francisco, Cal.

272 ft. per hour—25 ft.  
width—maximum single  
days pour 8-6-8 inch  
thickness.

190 ft. per hour—25 ft.  
width—Average for job.

## NEW YORK

Rome Airport, Rome, N. Y.  
Contractor: Turner Const. Co.

—Louis Meyersohn.

167 ft. per hour—25 ft.  
width; 9-7-9 inch thick-  
ness.

## MARYLAND

Edgewood Arsenal Airport.  
Contractor: Cummins Con-  
struction Corporation,  
Baltimore, Md.

400 ft. per hour—12 ft.  
6 in. wide; 9-6 inch thick-  
ness.

## INDIANA

Jefferson Proving Ground,  
Madison, Ind.

Contractor: Simmons-  
O'Connor Co., Ft. Wayne,  
Ind.

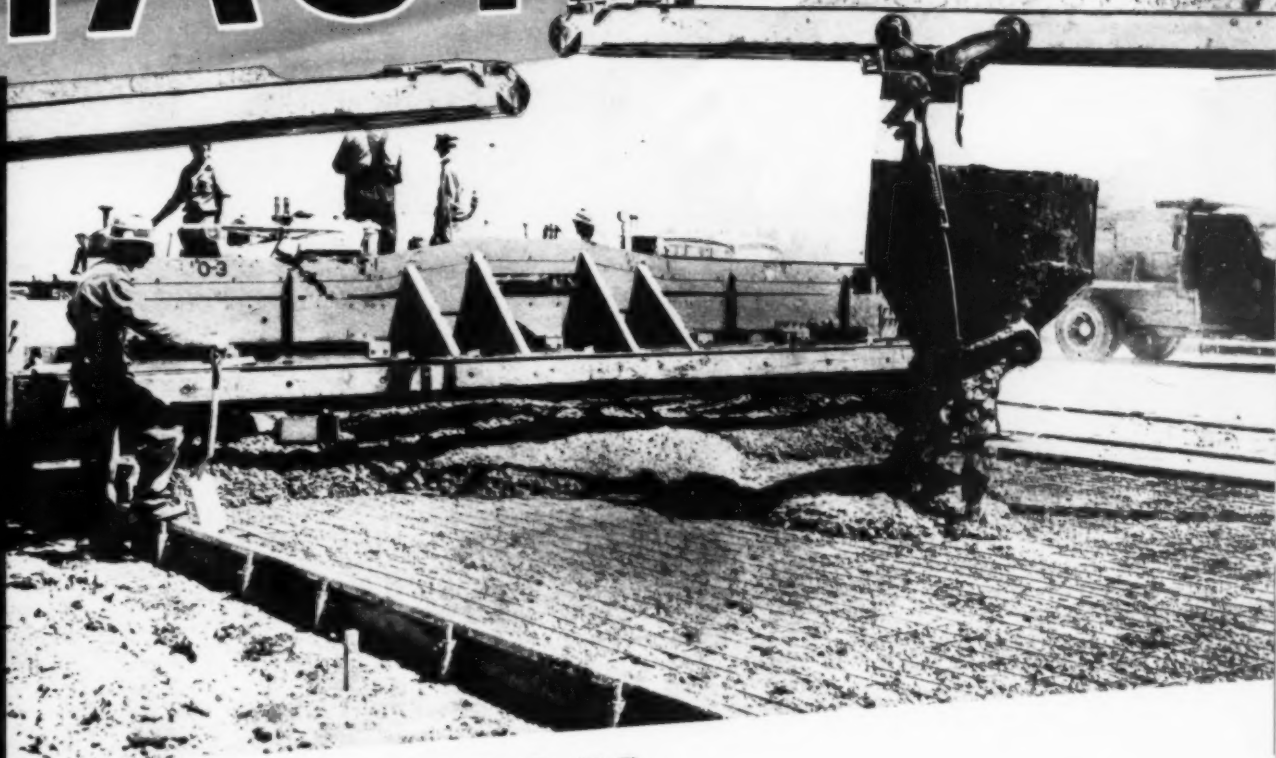
239 ft. per hour—22 ft.  
width; 6 inch thickness.  
Average for job

## WASHINGTON

Geiger Field, Spokane,  
Wash.

Contractor: J. H. Collins,  
Spokane, Wash.

250 ft. per hour—25 ft.  
width; 8-6-8 inch thick-  
ness.



## BLAW-KNOX

### ... CONCRETE SPREADERS ... PAVEMENT FINISHERS

... this efficient slab-laying team serves the demands of airport construction for new speeds in paving production by breaking all known concreting records.

The authentic job data shown to the left tells the story.

Spreading and finishing concrete slab at speeds to tax the maximum yardage output of the biggest paving mixers—scores of vital projects are being completed ahead of time (at Hamilton Field a 25 ft. width Blaw-Knox Spreader-Vibrator handles the output of three 27E pavers, all operating at full blast).

Contractors who have for many years looked to Blaw-Knox for the latest and best in paving equipment are now mechanizing their jobs with

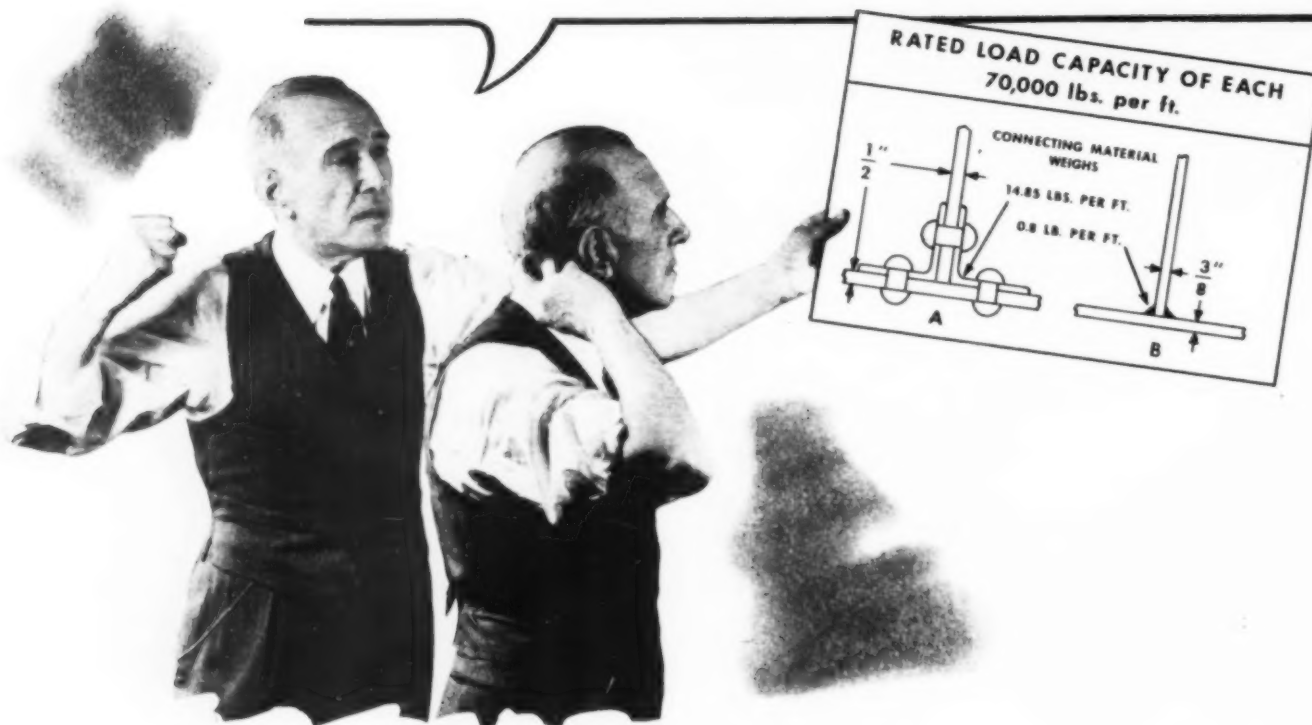
**BLAW-KNOX Transverse Blade CONCRETE SPREADERS**  
and

**BLAW-KNOX Model XB Gas Driven FINISHING MACHINES**  
(Either machine equipped with vibrator if desired)

Blaw-Knox will be glad to send you complete details of these cost reducing, time saving machines.

**BLAW-KNOX DIVISION of Blaw-Knox Co.,  
PITTSBURGH, PA.**

*then I said to myself—*



## This looks like . . . MORE FOR LESS

*We've been more or less successful in our methods—but let's assume we're wrong. Let's get a fresh start and prove each step as right before we take it.*

**ALTER EGO:** Fine exercise to prevent manufacturing ruts. Let's start with the two ways of joining two plates at right angle, say. What's the procedure for method "A"?

*It's plain to see we hold the plates with angles and rivets. We must drill or punch holes, fit them up, fill them up with rivets and hammer down the heads of the rivets. This requires 14.85 pounds of connecting material per foot of joint.*

**ALTER EGO:** And in method "B" you just weld a bead along each side of

the joint. This joint requires only 8/10 of a pound of connecting material per foot. But look closer, what else do you find?

*Here's the big point. To get a load capacity of 70,000 pounds per foot, in the case of "A" we must use 1/2-inch plate—while in "B" we can use only 3/8-inch plate!*

**ALTER EGO:** Isn't it obvious then that welding gives MORE for LESS. Now, how can we get that for our present work and future plans?

*A good starter would be to invest \$1.50 in that Procedure Handbook which is published by The Lincoln Electric Company, Cleveland, Ohio, and study it so that we can figure out how arc welding can give us MORE for LESS.*

ALTER EGO: Literally, "one's other self"—the still, small voice that questions, inspires and corrects our conscious action.



# for those Grading Jobs..



**G**OT A DEFENSE PROJECT to grade—an airport, ammunition dump, defense building site, access road? Let this modern Adams equipment handle it for you quickly and at low cost. All Adams machines are easy to operate, are readily adaptable to a wide variety of jobs and, above all, are good for 24-hour-per-day, dependable performance with a minimum of upkeep. Anticipate your requirements and see your local Adams representative now for full information.

**J. D. ADAMS COMPANY, INDIANAPOLIS, INDIANA**

*Sales and Service throughout the World*

## ▲ MOTOR GRADERS

Adams Motor Graders are offered in light, medium and heavy-duty sizes, with 31 to 68½ h.p. engines—gasoline and Diesel.

## LEANING WHEEL GRADERS ➡

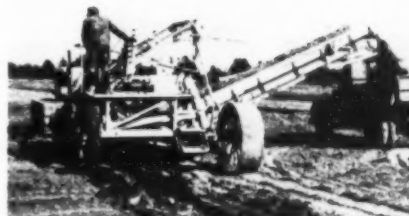
Furnished in 8, 10, and 12 ft. models, hand or power controlled. Capable of any type of surface, ditch, or bank work.

## ELEVATING GRADERS ➡

Ideal for leveling most air field sites. Move a lot of dirt per day.

## HAULING SCRAPERS ➡

Available in several sizes for use with any tractor. Load easily—dump and spread quickly and to specifications. Ideal for all types of "short haul" grading.



## THE ADAMS LINE INCLUDES:

Motor Graders—in six models. Gasoline or Diesel engines.  
 Leaning Wheel Graders—6½ to 12 ft. blade sizes. Hand and power operated.  
 Elevating Graders—with 42 in. or 48 in. carriers. Fully power operated.  
 Hauling Scrapers—cable controlled. Available in several sizes.  
 Tamping Rollers—have exclusive removable foot feature which increases range of application.  
 Road Maintainers—multiple-blade type, automatic blade control feature.  
 For high-speed operation (up to 15 m.p.h.) behind trucks or tractors.  
 Miscellaneous Tools—Rotary Scrapers, Plows, etc. Blades for all types and makes of road machines.

# ADAMS

## ROAD-BUILDING AND EARTH-MOVING EQUIPMENT

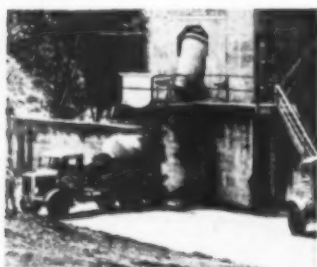
# New SMITH TILTER

— the Product of 42 Years' Experience



## BIG Concrete Jobs are Poured by SMITH

From coast to coast, and in many foreign countries, Smith Mixers have been an important factor in building the world's greatest concrete structures. The map above shows only a few of the more outstanding U. S. projects. Hundreds more could be listed.



### Pre-Mix Plants

Certified Concrete, Ltd., New Zealand, one of numerous Pre-Mix Plants employing Smith Tilting Mixers and Smith-Mobile Agitators — the winning combination for mixing and delivering uniform concrete.

## America Looks to SMITH for Better Concrete Mixers!

The T. L. Smith Company's acknowledged leadership in the industry is the result of 42 years' specialized experience in building concrete mixers of all types and sizes. It is natural, therefore, that contractors and engineers should look to Smith for important developments in mixer design.

Only two years ago, Smith announced a new tilting mixer with many advanced features. Now Smith proudly presents an even newer model with more important improvements such as: All-welded box girder pedestals and tilting frame . . . Heat-treated, high carbon steel roller track, drum gear and pinion with machine cut teeth . . . Forged, heat-treated edge rollers and main rollers . . . Faster and steeper tilt with choice of modern hydraulic or pneumatic tilting unit . . . Fully enclosed, machine cut spur gear transmission unit with splined alloy steel shafts . . . Direct-connected motor drive . . . Etc.

Naturally, all new model Smith Tilters retain the famous Smith duo-cone drum with its fast discharge and "End-to-Center" mixing action. The last word in concrete mixer design and construction.

Smith Tilters are available in all sizes up to and including 4 yards per batch. Write today for further information.

**THE T. L. SMITH COMPANY**

2851 North 32nd Street • Milwaukee, Wis., U. S. A.



**CONCRETE MIXER MANUFACTURERS SINCE 1900**



# 29 NORTHWESTS

FOR *Walsh*  
*Construction Co.*  
DAVENPORT IA.

TWENTY-NINE machines is an enviable testimonial to Northwest performance, but when it is considered that Walsh Construction Company was among the purchasers of the first 100 Northwest machines, the strength of the testimonial is doubled.

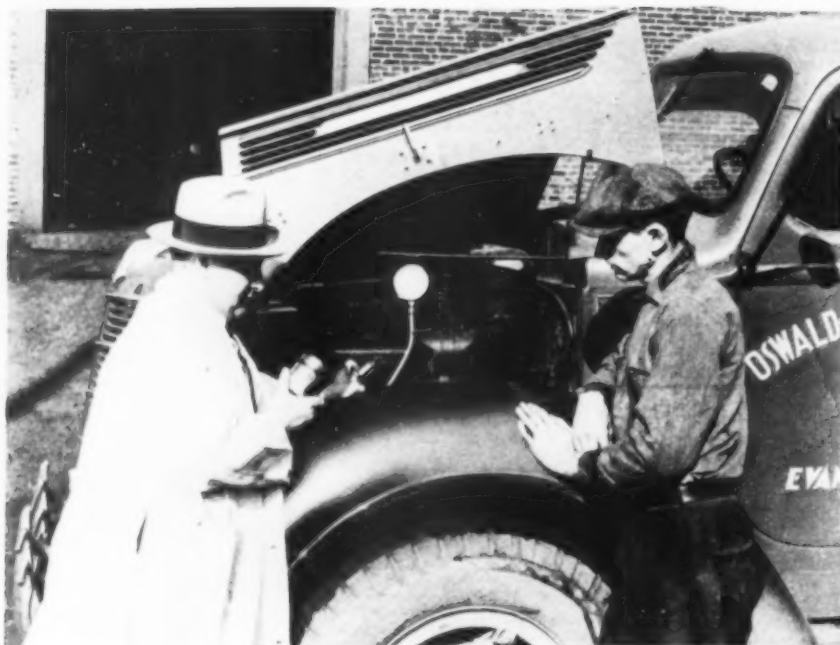
Getting things done is what counts today! You need ability to stay on the job, and speed for rapid output. Northwests have proved their ability with the nation's leading contractors.

NORTHWEST ENGINEERING COMPANY  
1728 Steger Building  
28 East Jackson Boulevard  
Chicago, Illinois

GASOLINE  
ELECTRIC  
DIESEL  
OIL

Built  
in a range  
of 18 SIZES  
3/8 yd. capacity  
and  
Larger

DOVELS • CRANES • DRAGLINES • PULLSHOVELS • SKIMMERS



Automotive Engineer J. A. Mowbry (left) explaining the instruments he uses for checking fleet engines to Virgil Pale of the Oswald-Sparrenberger Truck Company at Evansville, Indiana.

Exhaust gas analysis, a check of compression pressures, and a thorough test of the ignition system are some of the methods an Automotive Engineer uses to get accurate information on the condition of fleet engines. These tests on a few units in your fleet may save hours of maintenance time on the whole fleet.

## HELPS BUS AND TRUCK FLEETS MAKE MAINTENANCE RECORDS

Here's one reason why even the best equipped fleet maintenance departments have found Standard Automotive Engineering profitable.

These Engineers know what the fuels and lubricants they recommend have done on other fleets. They know the cost-saving records that have been made on equipment just like yours. They're interested in helping you equal or better these records.

Gasoline and oil consumption records aren't the only items. Exhaust smoke, spark plug replacements, wheel bearing failures, and Diesel injector wear are some of the many problems which these Engineers have helped solve for bus and truck fleet operators.



## STANDARD FLEET SERVICE HELPS OPERATORS CUT COSTS MANY WAYS

## HELPS CONTRACTORS AVOID DELAYS ON THE JOB

Are you getting ready to put your gasoline and Diesel powered equipment in condition for the big construction season to come? Put a Standard Automotive Engineer to work right now on this job.

He'll recommend the fuels and lubricants you need, and help your maintenance men tune and adjust your equipment to use these products most economically. But more than that, when your equipment goes on the job, one of these Engineers will see that you get exactly the products you need where and when you want them.

## IT COSTS NOTHING TO FIND OUT HOW A STANDARD AUTOMOTIVE ENGINEER CAN HELP YOU

Wouldn't you like to know just how these Automotive Engineers work and what they do? You don't have to obligate yourself in any way to find out. Just write one of the local Standard Oil Company (Indiana) offices listed below or write 910 South Michigan Avenue, Chicago, Illinois. In Nebraska, write Standard Oil Company of Nebraska at Omaha. Ask for the Engineer nearest you. He'll be glad to explain his work and answer your questions.

**COLORADO**  
Denver  
**ILLINOIS**  
Chicago  
Decatur  
Joliet  
Peoria  
Quincy  
**INDIANA**  
Evansville  
Indianapolis  
South Bend

**IOWA**  
Davenport  
Des Moines  
Mason City  
**KANSAS**  
Wichita  
**MICHIGAN**  
Detroit  
Grand Rapids  
Saginaw

**MINNESOTA**  
Duluth  
Mankato  
Minneapolis  
**MISSOURI**  
Kansas City  
St. Louis  
St. Joseph  
**MONTANA**  
Billings

**NORTH DAKOTA**  
 Fargo  
**SOUTH DAKOTA**  
Huron  
**WISCONSIN**  
Green Bay  
La Crosse  
Milwaukee  
**WYOMING**  
Cheyenne

Copyr. 1942, Standard Oil Company (Indiana)

# STANDARD OIL COMPANY (INDIANA) AUTOMOTIVE ENGINEERING SERVICE

LOWERS  
MILEAGE  
COSTS



# Short work for a **BUCKEYE!**

## **GOING! ... GOING!**

HERE'S a step by step picture of Ray Kebbe's Diesel-powered Cletrac and Buckeye Bulldozer smashing through on a highway relocation job in Michigan with 'skinner Tony Dertz at the controls.

Buckeye Bulldozers make short work of jobs like this. They're built to take a beating and they're lightning-fast with Buckeye fingertip cable control that gives you power to spare on the heavy lifts! In dirt-moving, Buckeye blades dig their own way in and *roll* the dirt ahead for bigger payloads every time. Buckeye engineered balance means full traction behind the load and less wear and tear on the tractor. And the new Buckeye UNITILT design gives you *interchangeable* blades plus a patented tilting action that's adjusted by a twist of the wrist.

Plan now to put Buckeye 'Dozers on your machines. Ask for complete details.



## **... GONE!**

**BUCKEYE TRACTION DITCHER CO.**  
Findlay • Ohio

# *Built by* **Buckeye** ✓

Convertible Shovels



Trenchers



Tractor Equipment



R-B Finegraders



Road Wideners



Spreaders



**$\frac{3}{8}$  TO 3 YARD CAPACITY**

# **LINK-BELT SPEEDER**

**SHOVELS—DRAGLINES  
CRANES**



## *Boosting* **PRODUCTION OF VITAL MANGANESE**



Here is the second Link-Belt Speeder shovel purchased by Interstate Manganese Corporation to boost production of manganese—one of the most important alloying elements for making good steel.

A powerful, rugged machine was needed. Based on the performance of their first Link-Belt Speeder, it was natural that Interstate Manganese again chose another Speeder—the Model “75”,  $\frac{3}{4}$  yard capacity. Ample strength and weight make this machine an ideal unit for hard, continuous excavation work, with extra speed and power for high yardage output.

The rugged and simple design of the upper machinery assures trouble-free performance and lowest maintenance cost. A chain crowd, which is self-adjusting to all boom angles, provides maximum digging power under toughest conditions. Long, wide crawlers and a 73" diameter turntable give the Model “75” extra stability on slopes and in heavy digging.

Write us today for complete information on this or any other machine of Link-Belt Speeder's line. There are twenty-one different models to suit all of your needs.

8786

## **LINK-BELT SPEEDER CORPORATION**

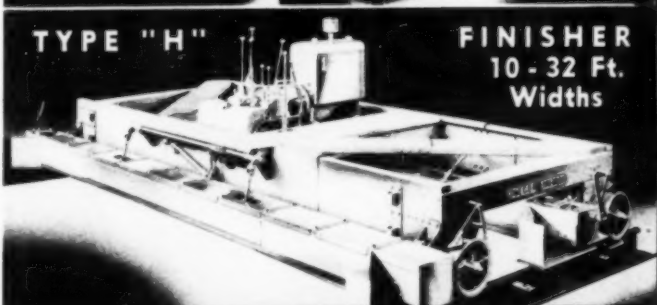
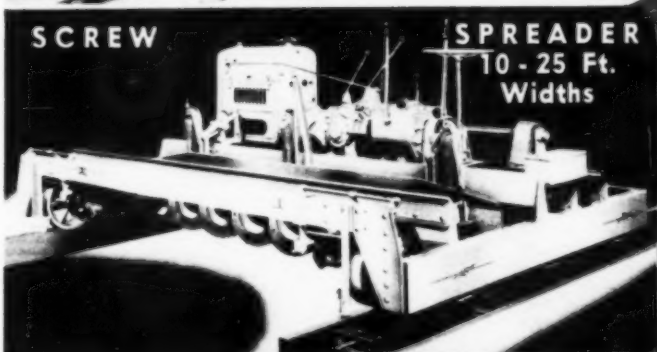
*Builders of the Most Complete Line of Shovels and Cranes*

**301 WEST PERSHING ROAD**

**CHICAGO, ILLINOIS**



On Vital Roads and Airports from Alaska to Trinidad  
**THIS JAEGER TEAM**  
 Gets **HIGH** Production  
 Gives **LOW** Job Cost



**Paves as Fast as Dual-Drum or Tandem Pavers Can Produce — Handles Driest Mix — Cuts Cost Behind Pavers Big or Small!**

This "mechanized" method, originated by Jaeger, has made it possible for contractors to meet vital Defense construction schedules — use dual drum or multiple pavers to capacity, laying any standard width to 25 ft. ... A necessity with big pavers, an advantage even with single 27E pavers on the stiff, dry mixes of today.

**The ONLY Spreader That Guarantees Against Segregation — Remixes as It Spreads — VIBRATION if Desired**

Action of the Jaeger Spreading Screw increases the density and uniformity of concrete — no stone pockets, minimum honeycomb — an exclusive advantage proved by 12 years' use. One operator replaces hand crew, spreads and strikes off both mesh course and top at capacity of biggest pavers, even on half widths. Vibratory Attachment can be furnished or quickly installed in field.

**The ONE Completely Modern Finisher, Unequalled in Speed, in Flexibility and Precision Smoothness of Its Finish**

With 100% effective speed ranges, independent screed speeds, hydraulic screed lifts and "velvet touch" operation, this latest type Jaeger-Lakewood sets new standards for capacity and smoothness. Transmission in front gives direct lever control of any function. Quick built-in width changes to 4 ft. Vibratory models give deep internal vibration — the original, unfailingly successful Jaeger method.

**THE JAEGER MACHINE COMPANY**

800 DUBLIN AVENUE  
 COLUMBUS, OHIO

WORLD'S LARGEST MANUFACTURER OF SPREADING, FINISHING EQUIPMENT (Concrete, Bituminous) — MIXER, PUMPS, BUCKETS, TOWERS

It's got what  
you need for today's  
**BIG JOBS**

The New Goodyear  
**ALL-WEATHER**  
EARTH MOVER TIRE

**W**ITH America's war effort moving into high - off-the-road equipment is working on a 'round-the-clock schedule. That calls for tires that can carry maximum loads, through any kind of going, without time out for repairs.

The Goodyear All-Weather Earth Mover does all that, and more.

Tough, husky rubber in tread and sidewalls provides longer wear, greater resistance to cutting and gouging. It's rugged enough to handle even shale and solid rock blastings.

The All-Weather tread design extends over shoulders down to center of sidewalls - insuring side traction, preventing side slip on grades.

Its broad tread channels mean that earth won't pack up to slow you down - those smooth-rounded edges expel stones and dirt.

A new high-tensile cord carcass affords greater bruise resistance.

Add extra-sturdy beads, a maximum cross section - and you've got a tire that measures up to the strain today's important, hurry-up jobs may place on it.

The Goodyear All-Weather Earth Mover is made in all popular sizes. Specify on new equipment; order from your Goodyear dealer for present equipment.



All-Weather - T.M. The Goodyear Tire & Rubber Company

**MORE TONS ARE HAULED ON GOODYEAR TRUCK**

**TIRES THAN ON ANY OTHER KIND**



# Construction Methods

ROBERT K. TOMLIN, Editor

Volume 24

FEBRUARY, 1942

Number 2

**GRADING OF ROAD** was done by P. W. Ryan Sons, contractor, with carrying scrapers hauled by fleet of Allis-Chalmers tractors.



**FLAT BACK SLOPES** characterize grading of Wisconsin highway to cross-section designed for minimum erosion and snow drifting.



**ROUNDED TOPS** are specified for flat back slopes of 5-mi. length of Wisconsin road, with surfaced width of 41 ft.

## *Flat Back Slopes*

**Feature**

**Road-Grading Job**

**DATING BACK SEVERAL YEARS**, flat back slopes and streamlined ditches have been incorporated in the design of Wisconsin highways, where natural conditions permit, not only to enhance the general appearance of the roads, but also for the very practical purposes, as pointed out by A. T. Bleck, construction engineer for the Wisconsin Highway Commission, of curtailing erosion and minimizing the effect of snow drifting. Typical of the improved design is a completed grading project between Gratiot and Hicks Corners, in Lafayette County, (Continued on page 137)



**IN DEEP CUT** of Contra Costa Canal extension, being built by U.S. Bureau of Reclamation as part of Central Valley project, Calif., crane on bank lowers bucket of concrete to paving machine placing 3-in. lining on canal slopes and bottom. Machine travels on steel rails.



British Combine Photo

**AFRICAN CAMPAIGN** of British imperial forces driving Axis units into Western Desert leads to extension of rail supply line by New Zealand railway construction troops with assistance of military engineers and Indian labor. New Zealanders cut spike holes in ties with pneumatic drills.



**TEMPORARY OFFICE BUILDINGS** to take care of war expansion cover acres of land in Washington, where these units, designated T and U by Public Buildings Administration, in charge of construction, rapidly approach occupancy stage.

# THIS MONTH'S NEWS REEL



**EXPRESS HIGHWAY** (left) recently completed through Arroyo Seco canyon to speed travel between Los Angeles and Pasadena, Calif., includes number of grade separation structures, some of which, like modified clover leaf in foreground, combine overpass with bridge across flood channel.







**QUICK START** marks construction operations on Keswick Dam and power plant, located downstream from Shasta Dam on Sacramento River in U.S. Bureau of Reclamation's Central Valley project. First bucket of concrete (right) is deposited by Atkinson-Kier Co., contractor, on Nov. 14; concrete in place for foundations of west abutment (above) shows progress made by first week of January.

**KESWICK DAM**  
1st BUCKET OF CONCRETE  
PLACED UNDER DIRECTION  
U.S. BUREAU OF RECLAMATION  
ATKINSON KIER COMPANY  
NOVEMBER 14TH 1941

**NAVY AIRPLANE HANGARS (below)** of thin-shell concrete barrel-arch type designed by Roberts & Schaefer Co., Chicago, are erected for Bureau of Yards & Docks, Navy Department, at San Diego Naval Operating Base by Golden & Treppe Construction Co., San Diego, Calif., using pumped concrete and wood arch forms on movable timber falsework.



Wide World Photo

**FORT LOUDON DAM (below)** on Tennessee River 55 mi. below Knoxville is constructed by TVA forces working on schedule which calls for closure and first storage of water in January, 1943. Dam, 135 ft. high and 4,835 ft. long, will form reservoir of 14,900-acre area extending 47 mi. upstream.



**SHASTA DAM** on Sacramento River, Calif., reaches 65 percent of completion at beginning of year, with more than 2,500,000 cu.yd. already placed by Pacific Constructors, Inc., of 6,000,000 cu.yd. of concrete required. Largest unit in Bureau of Reclamation's Central Valley project, dam has maximum height of 602 ft. from bedrock to roadway on top. Generating machinery is now being installed in power house below dam.

**GASOLINE PIPE LINE (below)** 456 mi. long from Port St. Joe, Fla., to Chattanooga, Tenn., is completed by Southeastern Pipeline Co., owned jointly by Gulf Oil Corp. and Pure Oil Co., with Williams Bros. Corp., Tulsa, Okla., as contractor on section between Atlanta and Chattanooga. Construction of line, which has capacity of 30,000 bbl. a day, took 31,000 tons of steel and cost \$6,500,000, including pumping and terminal facilities.





# ROADS TO

How Highways Served Army During  
Large-Scale Maneuvers in South  
and What Lessons Were Learned  
From Their Use

By LIEUT. COL. A. ROBERT GINSBURGH

General Staff Corps,  
War Department, Washington, D. C.



# Victory

Photos, U.S. Army Signal Corps

**AMERICA AT PEACE** thought of roads in terms of commerce, travel and recreation. America at war must regard them primarily in their military role as arteries of military transportation and communication. We must find the road to victory.

Fortunately, the highways of our 48 states add up to the most extensive and well-built road system of any nation in the world. This is fortunate, because it is these roads,

**TRAFFIC JAMS (below)** are likely to occur on roads of inadequate width, without wide, hard shoulders on which, when necessary, trucks can pull out for repairs or changing tires.

**SHOVEL LOADING ATTACHMENT (below)** is rigged on crawler tractor for army earth-moving operations.

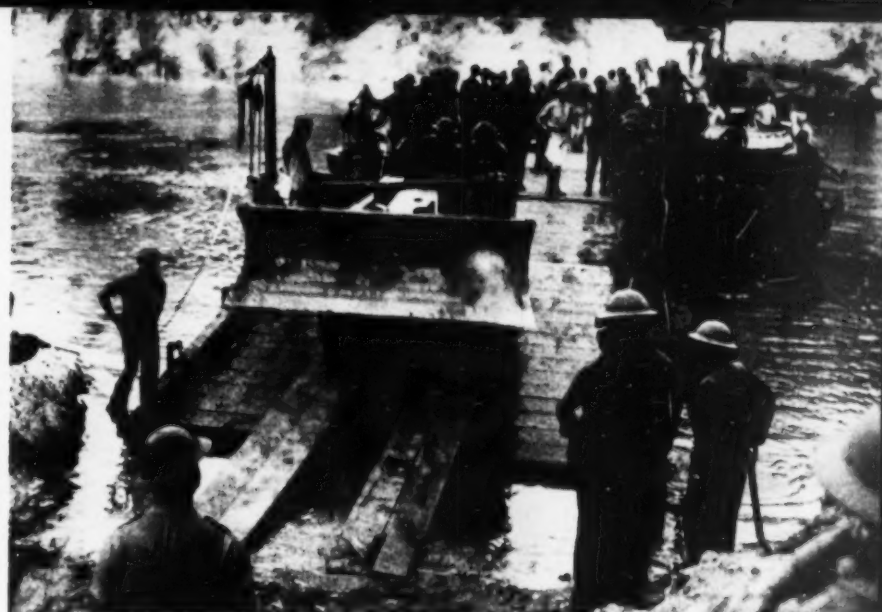
**MECHANICAL EQUIPMENT (below)** plays an important part in Engineer operations during simulated warfare in Louisiana. Here bulldozer blade on tractor grades earth approach to ponton bridge across river.







**WEAK BRIDGES** on rural roads impede movement of Army's present-day mechanized equipment. Here medium 28-ton tank breaks through floor of wood structure posted for load limit of 2 tons per axle.



**FLOATING BRIDGE** has adequate supporting power for passage of mechanical road grading equipment during Louisiana maneuvers.

already built and in use, which must serve as the core of our military road network.

The roads might have been wider. They could have had stronger and wider shoulders, more islands, better grading at curves. They might have provided more direct routing between military and production centers. All these advantages we might have had, if only we Americans had thought of defense needs first and always, as did some peoples more military-minded than we. But since we did not, we must utilize to best advantage what roads we have.

That is the principle on which the Corps of Engineers of the United States Army operates—the utilization and

IN THE ACCOMPANYING ARTICLE, written expressly for *Construction Methods*, Col. Ginsburgh, a member of the Army's General Staff Corp on duty in the Office of the Under Secretary of War, explains, authoritatively, the role that highways played in the recent large-scale army maneuvers in the South, and discusses the road-building and maintenance lessons learned from that experience under conditions of simulated warfare. Adequate roads and bridges, providing for mobility of troops and equipment, are a vital element of modern military strategy. Every road-builder, whether he be in civilian or military service, will be repaid by a careful reading of what Col. Ginsburgh has to say about the relation of highways to warfare and to industrial production for war needs.—EDITOR



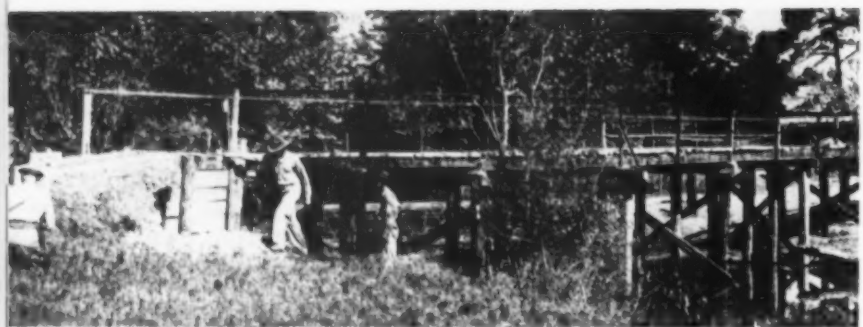
**COMPLETED PONTON BRIDGE**, with end sections carried by adjustable trestle bents, carries column of tanks and trucks across river.

**POOR ROADS IN RURAL DISTRICTS** (below) delay transportation of troops, equipment and other materials, reducing speed of travel and causing mechanical damage to trucks.





**AFTER BRIDGE IS "BOMBED,"** according to decision of Army umpires during maneuvers in Louisiana, howitzer (above) of Blue Forces, 14th Field Artillery, 2nd Armored Division, is detoured around structure. At same location light tank (below) of 66th Regiment, 2nd Armored Division, bypasses "bombed" bridge on improvised detour of corduroy construction.



**WEAK BRIDGES** in outlying rural districts must be strengthened to carry heavy weights of army's mechanized equipment.

**CORDUROY ROAD (below)** of logs cut from adjacent woods is constructed by 12th Engineers to facilitate passage of motorized equipment of First Army across deep sand during maneuvers in South Carolina.



**APPROACHES TO RIVER CROSSING** by ponton bridge in North Carolina are graded with aid of tractor-bulldozer units, preparatory to troop movements during simulated battle.

maintenance of roads already in existence to the best possible military advantage. So it was most reassuring to the Army recently to find that the American road network will stand up under the galling wear given it by armies on the march.

*Roads in Army Maneuvers*—During the last few months, thousands of miles of roads have been given the most grueling of treatments. During the Army maneuvers in the South these roads were subjected to the crushing pressure of 30-ton treaded tanks, to the grinding of dynamic half-tracks and tractors, to the tear of well-laden gun carriages and ammunition caissons, to speeding "jeeps," "peeps" and trucks, as well as to the pounding of thousands upon thousands of

(Continued on page 126)

**ADJUSTABLE TREXLE BENTS (below),** equipped with chain hoists, provide connections between shores and floating sections of ponton bridge.







**FOR GRADING ARMY AIRFIELD** for emergency use, engineers operate tractor-hauled carrying scrapers of 12 cu. yd. capacity to produce level area for takeoff and landing of combat planes during maneuvers in North Carolina.



**LIGHT FOOT BRIDGE** on ponton supports provides river crossing for troops.



**"INFILTRATION" MOVEMENTS**, in which vehicles of various types are intermingled, have been adopted for moving military columns through communities in order to create least possible interference with civilian traffic.



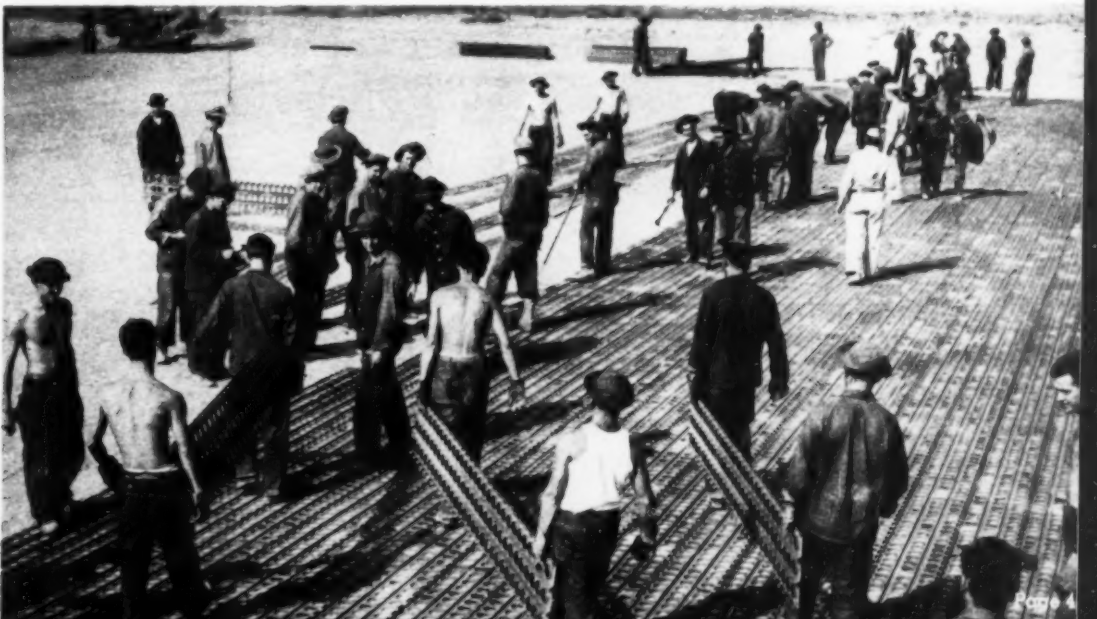
**AMPHIBIOUS TECHNIQUE** is demanded of 17th Engineers and 41st Infantry of 2nd Armored Division in setting trestle bent for floating bridge across Sabine River on Louisiana-Texas border.



**SOFT, NARROW SHOULDERS** are responsible for putting this army truck temporarily out of action.



**ADEQUATE ROAD SHOULDERS** provide marching space for troops en route to repair bridge "blown up" by enemy during Louisiana maneuvers, thus leaving traffic lanes unobstructed for passage of motor vehicles.



**FOR TEMPORARY AIRPLANE RUNWAYS (below)** on sandy soil in North Carolina engineer troops lay 10-gage perforated steel "planks," 10 ft. long and 16 in. wide, provided with interlocking edges.

# Air Base Paved With High Discharge Truck-Mixers and Screw-Type Concrete Spreaders



**HIGH DISCHARGE TRUCK-MIXERS**, backed in at angle, are able to windrow material as far as 4 to 5 ft. inside forms on both sides of grade. From drums of Jaeger units actual discharge time for 4.3 cu.yd. of 1-in. slump concrete is 2½ to 3 min. Only occasionally was it necessary for truck-mixer to discharge its batch at two points.

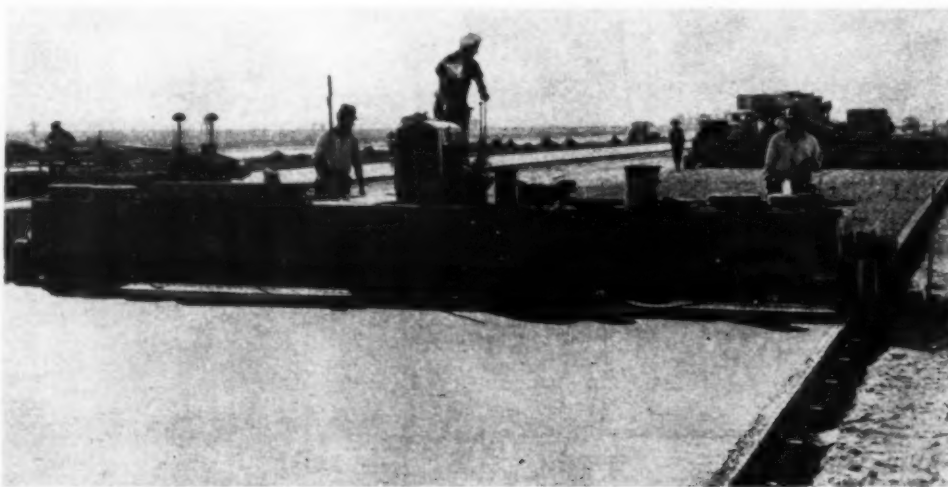


**REVERSIBLE RIGHT AND LEFT-HAND SCREW SECTIONS** on Jaeger concrete spreader remix and spread two windrows uniformly across 25-ft. grade. Adjustable strike-off plate leaves smooth, uniformly textured surface of accurate grade for finishing machine to work on. Extra rigid 7/32-in. forms are designed for heavy equipment load.

**TO MEET THE PROBLEM** of labor scarcity involved in laying 75,000 cu.yd. of Class A concrete in the desert 100 mi. from Los Angeles, Ferry & Pearson, paving contractors on the Muroc Bombing Base in California, decided to mechanize their job as completely as possible, including the use of truck-mixed concrete and a mechanical concrete spreader to spread and strike off the piles of stiff (minus 1-in. slump) material, ahead of the finishing machine.

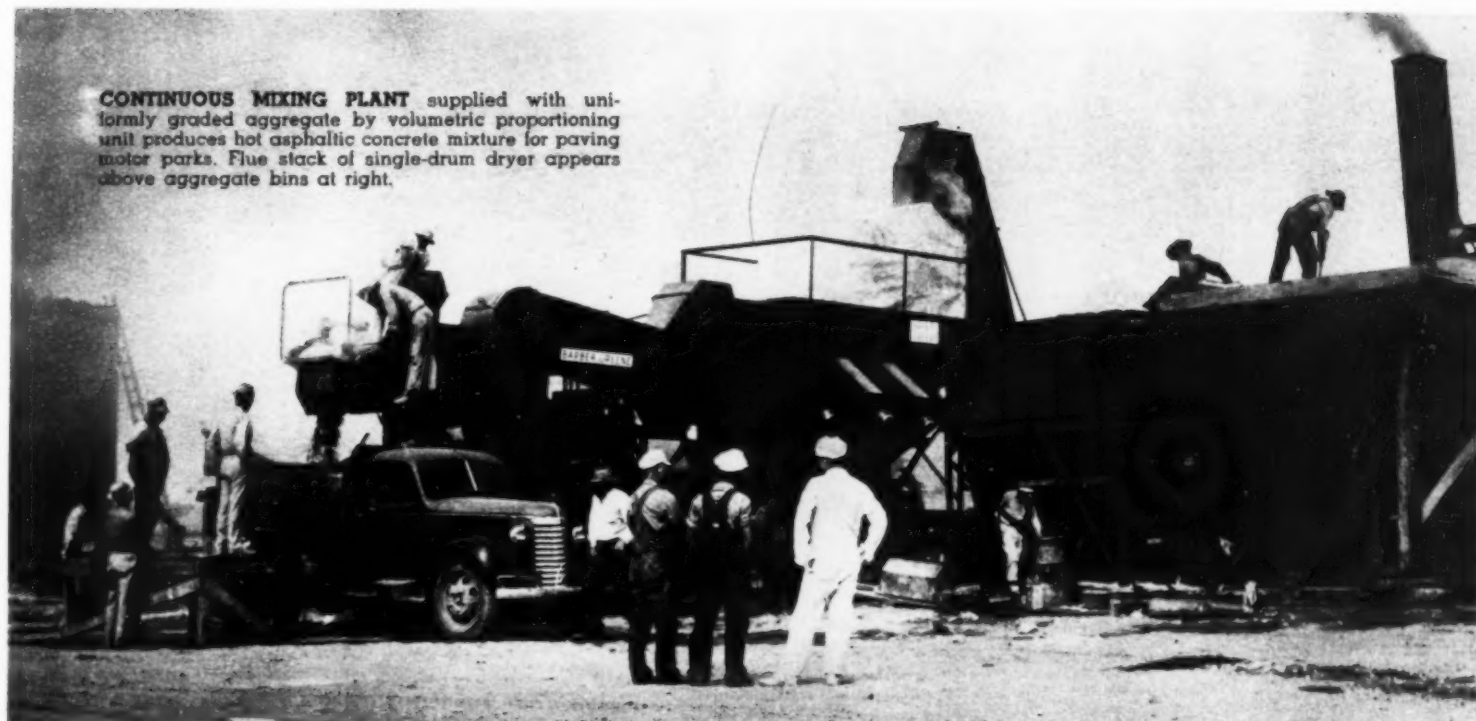
Preparatory work consisted of 240,000 cu.yd. of grading, 400,000 sq.yd. borrow sub-base compacted to 6 in. Concrete paving consisted of 6,800x300 ft. of Class A runways, 4,500x320 ft. of Class A anchorages, two taxiways 1,400x100 ft., two taxiways

(Continued on page 102)



**FINISHING MACHINE**, which follows concrete spreader, is equipped with two screeds and tamper for finishing the thick 9-6-9-in. slab in one course.





**CONTINUOUS MIXING PLANT** supplied with uniformly graded aggregate by volumetric proportioning unit produces hot asphaltic concrete mixture for paving motor parks. Flue stack of single-drum dryer appears above aggregate bins at right.

## FOUR FIRMS BUILD FOUR TYPES OF *Bituminous Pavement* AT FORT LEONARD WOOD

**HIGH-PRESSURE PRODUCTION** in three days and nights of new specifications covering four types of bituminous pavement cleared the track for tendering of bids July 30 on 50 mi. of streets and roads in Fort Leonard Wood, Mo., by veteran contractors whose previous bids, based on former specifications, had of necessity been rejected by the constructing quartermaster one month earlier. This action was taken after an authorized last-minute change of plans had caused modification of the program originally set up to carry out the first directive for roads in the 48,000-man army camp. Taking of new bids at a later date under a second directive for roads was made necessary by the sudden change in plans.

Notice of authorization for the second directive, carrying a \$550,000 allotment, was telephoned to the post by way of the Seventh Zone Constructing Quartermaster in Omaha on July 26, and the authorization itself arrived through the mail on the following day. To revive the weakened interest of



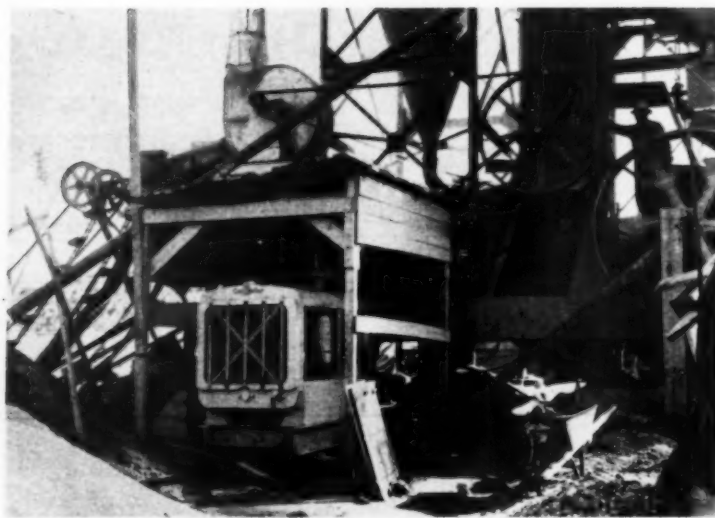
**PLATFORM SCALES** set up beside volumetric proportioning unit are used in conjunction with screen analyses to determine proper setting of calibrated gates under aggregate compartments of proportioning plant for delivery of uniformly graded material to continuous asphalt mixer.



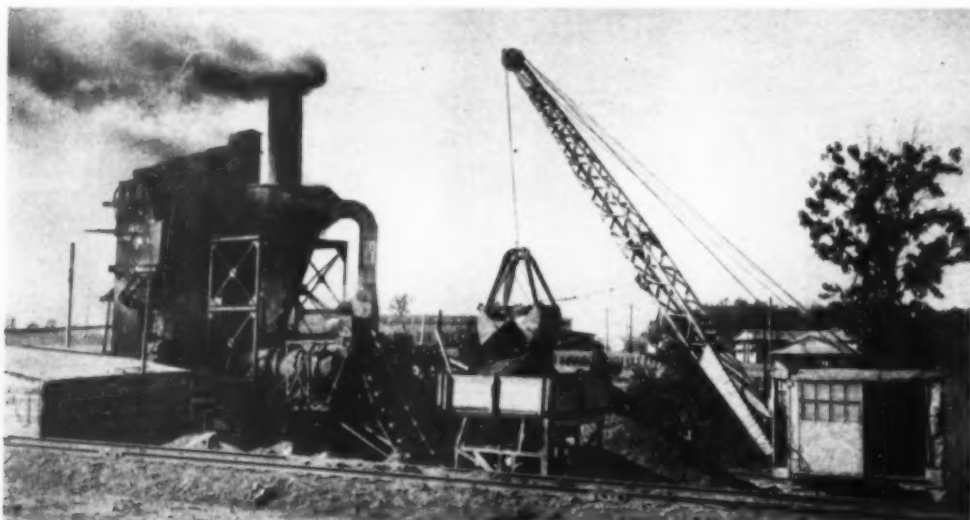
**LIMESTONE FINES** stacked in sacks are added to asphaltic concrete mixture through angular hopper on top of mixer at right.



**MOUNTED ON PNEUMATIC TIRES** for ready portability between jobs, mixer and aggregate proportioning unit, as well as dryer, are set up on cribbing at central plant location to supply asphaltic concrete for paving of motor parks.



**DIESEL POWER UNIT** drives mixer, dryer, elevators and screens of asphalt plant furnishing binder and wearing course mixtures for paving roads.



**CLAMSHELL CRANE** feeds aggregate to hopper over cold elevator of mixing plant producing asphaltic concrete for 2½-in. binder course and ½-in. wearing course on roads.



**TAMPING-LEVELING FINISHER** deposits, strikes off and compacts 1½-in. asphaltic concrete surface on parking area for motorized army equipment.

contractors whose hands had been exposed in the previous bidding and whose tenders were necessary to make the second letting a success, Jack P. Edwards, CQM engineer at the fort, undertook to write a completely new set of specifications for four types of bituminous roads in the 72 hr. between July 27 and July 30. On the latter date he was able to hand out copies of completely revised specifications to contractors' representatives gathered at Fort Wood. The next day, July 31, bids were opened and awards made for four types of bituminous paving to the three following firms:

(1) Granite Bituminous Paving Co., St. Louis, 7.5 mi. of asphaltic concrete 33 ft. wide, 2½-in. base and ½-in. wearing course on primed 6-in. stone base previously constructed, together with other asphaltic concrete pavement bringing the total to more than 155,000 sq. yd., at \$1.28 per sq. yd.

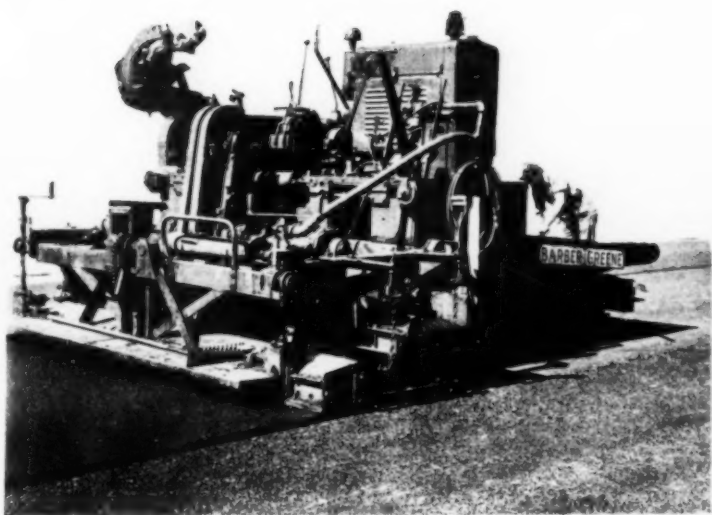
(2) O'Dell & Riney Construction Co., Hannibal, Mo., 7.8 mi. of 2-in. bituminous mat 30 ft. and 22 ft. wide with asphalt seal and armor on primed 3-in. stone base previously constructed, plus additional bituminous mat on other wi-

*(Continued on page 86)*

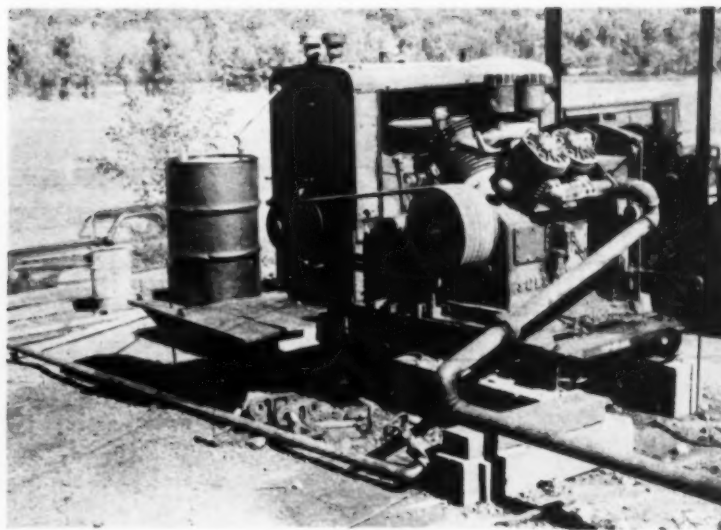


**PUSHING TRUCK AHEAD** as load is dumped into hopper, paving machine spreads and tamps





ON 2½-in. BINDER COURSE previously laid by same machine, tamping-leveling finisher applies ½-in. wearing course of asphaltic concrete.



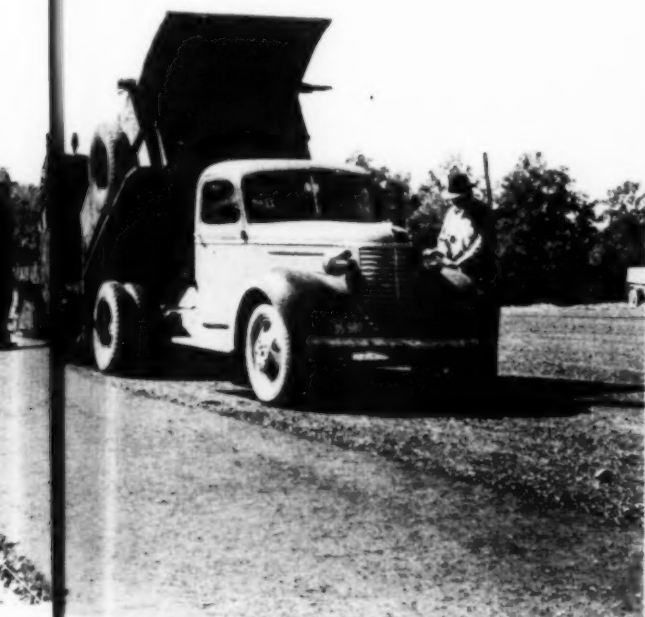
STATIONARY TWO-STAGE COMPRESSOR powered by diesel engine provides 500 cfm. of air to hand-held hammer drills in quarry.



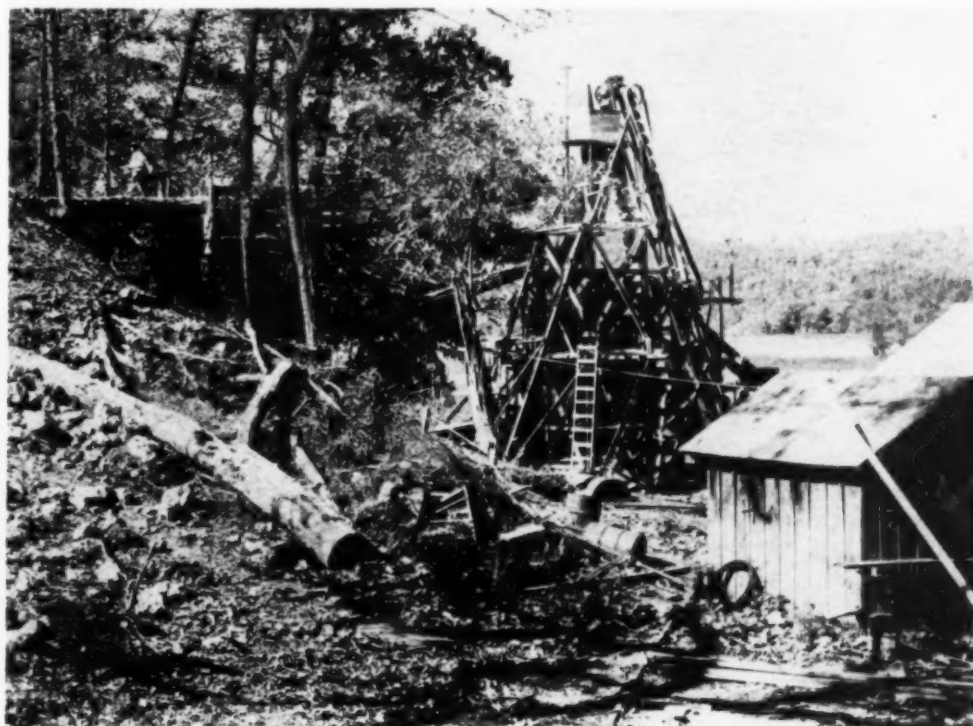
VERTICAL BREAST BOARD supports hammer drill and assists operator in horizontal drilling at limestone quarry.



TANDEM 8-TON ROLLER following spreader-finisher completes compacting and ironing of ½-in. asphaltic concrete wearing surface. Power broom, at left, removes dust and fine particles from roadbed prior to application of prime.



asphaltic concrete wearing surface to grade as it moves forward laying 10-ft. lane.



CRUSHING AND SCREENING PLANT adjacent to quarry produces average of 80 tons an hour of graded materials for stone base course on motor parks and for asphaltic concrete paving mixes.



**BY PULLING TWO SCRAPERS** in tandem behind one tractor, earthmoving contractor handles greater yardage per tractor hour.

By KENNETH F. PARK  
Chief Field Engineer  
R. G. Le Tourneau, Inc., Peoria, Ill.



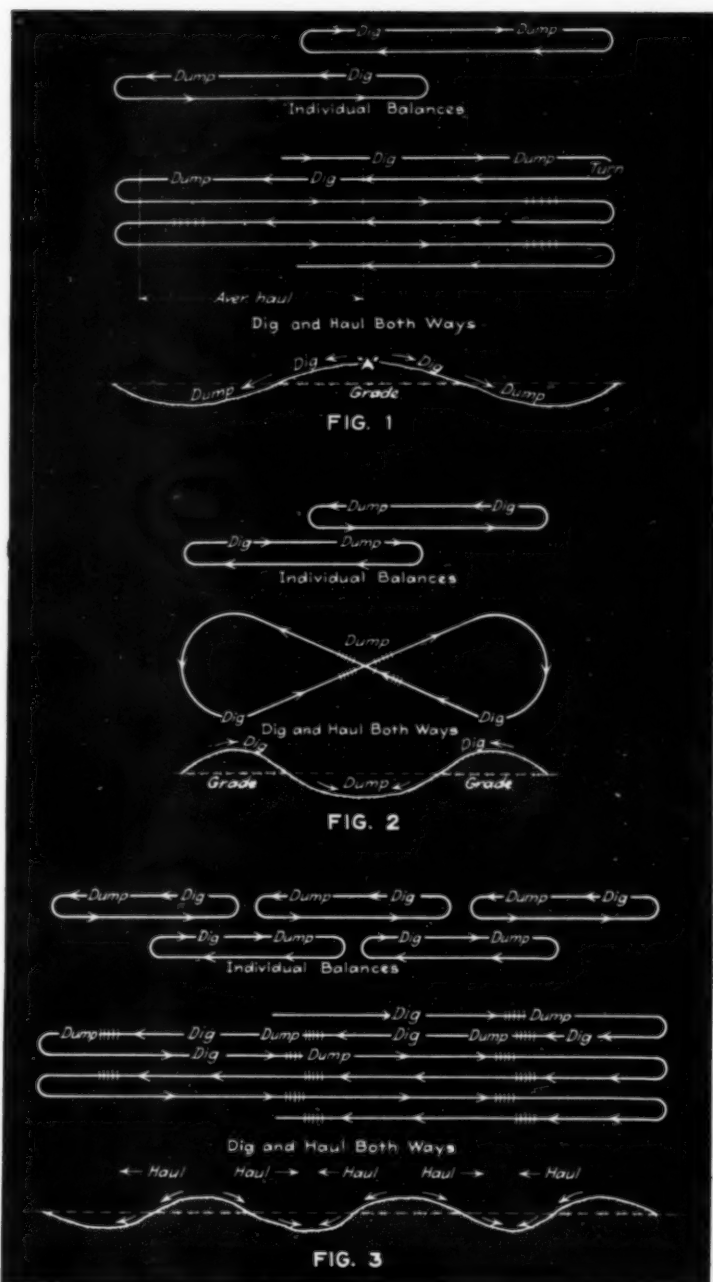
**DANGEROUS AND COSTLY CONDITION** caused by dusty haul roads can be corrected by use of sprinkler truck to improve visibility, reduce accidents and make top-speed travel safe.

**TODAY, BECAUSE NATIONAL DEFENSE** and priorities have made it difficult to obtain new equipment, many earthmovers face the problem of increasing production with their present tools. This problem is found not only on defense projects where tough time schedules demand top efficiency, but also on non-defense work. On jobs of the latter class, the importance of more work from present equipment is greatly increased because without priority ratings equipment deliveries are almost impossible.

Yesterday the task of effective job planning and maximum equipment efficiency was the problem of engineers. Today it is the problem of every person connected with earthmoving. The following ideas and suggestions are offered as methods of saving time, thus increasing production.

**Job Planning and Layout**—Success or failure of many earthmoving jobs is dependent upon job planning and layout. Before putting expensive equipment to work, the man in charge of a grading job should have a definite plan in mind, and he then should see that the plan is





Figs. 1, 2 and 3 . . . **BY HAULING IN BOTH DIRECTIONS**, instead of in one direction on individual balances, earthmoving units reduce time lost in turning and thereby increase productive efficiency.

carried out. Several of the accompanying drawings show layouts where loading and spreading can be accomplished in both directions to eliminate turns and lost motion.

Fig. 3 indicates a series of balances that can be handled together, with the earthmoving units hauling in both directions. Layouts similar to this one are encountered in highway work where the original ground line presents a rolling grade. The time-saving element in this particular procedure is outstanding, as only two turns must be made in a complete cycle in which five pay loads are delivered.

In contrast consider the same layout worked in such a way that cuts and fills are balanced individually, as shown in the upper diagram of Fig. 3. In this procedure, five pay loads require ten turns, or two turns for each cut and fill. The first procedure eliminates eight turns and, at an average of 0.25 min. for each turn, saves 2.0 min.

Let us assume that 8 pay yards is delivered per trip and that an individually balanced cycle requires 5.0 min. The five balances would require 25.0 min. to move five pay loads or 40 pay yards. On the other hand, the recommended cycle requires only 23.0 min. for five pay loads or 40 pay yards.

On an hourly basis,  $\frac{60}{23} \times 40 = 96$  yd. per hour, and  $\frac{60}{25} \times 40 =$

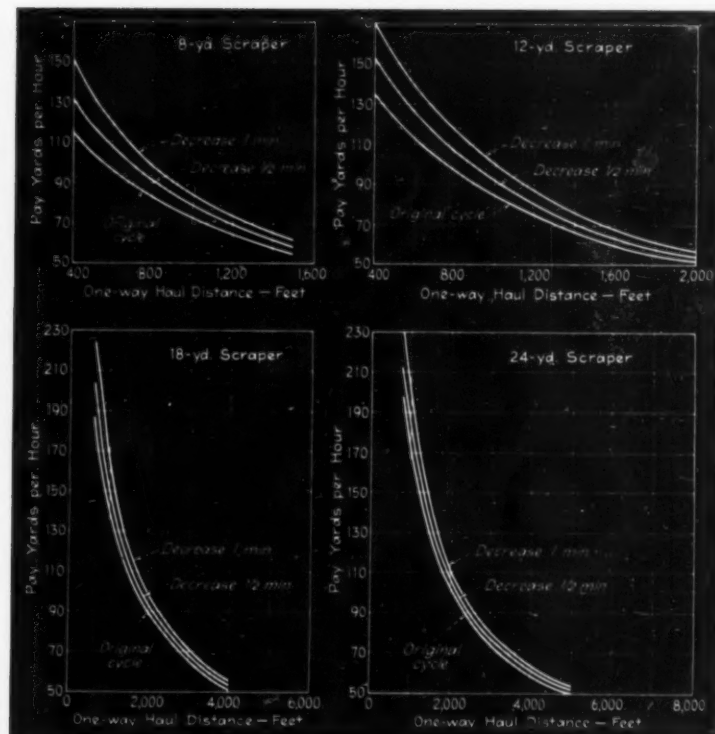


Fig. 4 . . . **PAY YARDS GAINED** by decreasing cycle time vary with sizes of scrapers and lengths of haul. Graphs are based on 100 percent job efficiency, including favorable digging and full 60-min. hour.

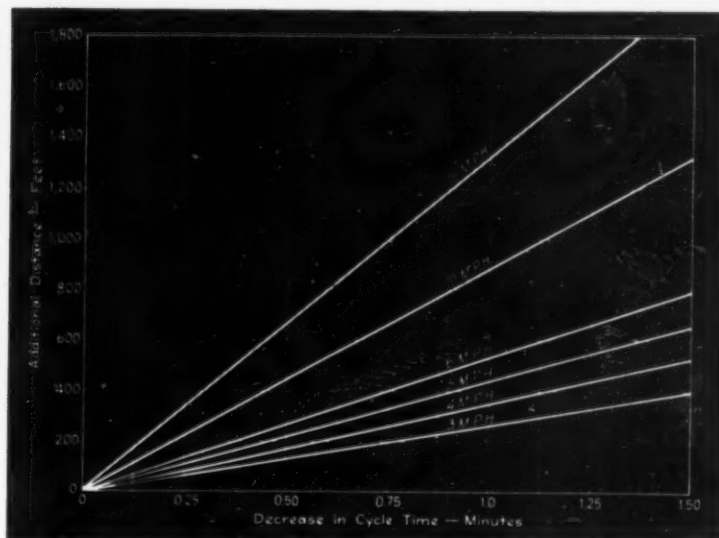


Fig. 5 . . . **DECREASE IN CYCLE TIME** enables earthmoving units to maintain equivalent production over lengthened hauling distances. Saving in time may be obtained by faster loading, by elimination of turns or by other means.

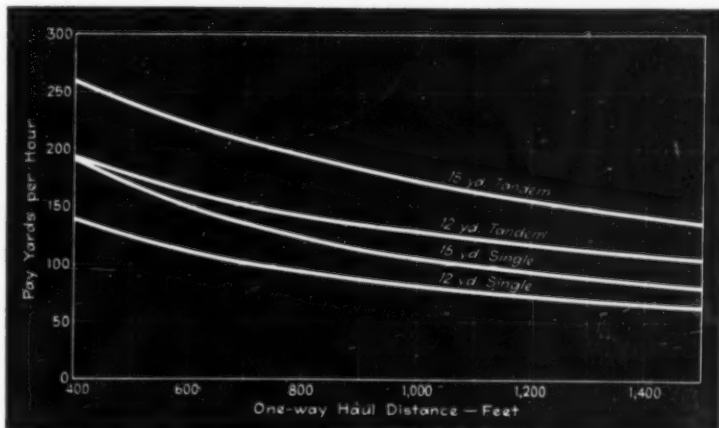
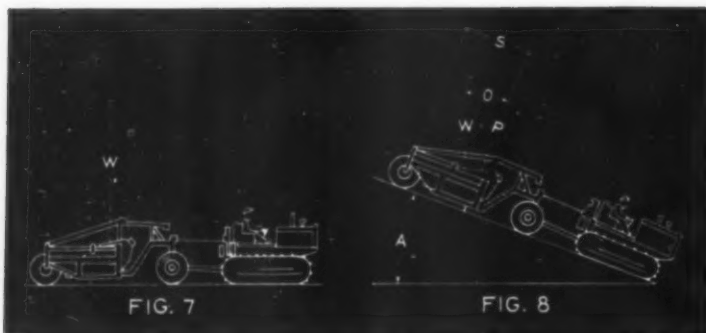


Fig. 6 . . . **TANDEM HOOK-UP** of two scrapers behind tractor increases yardage moved per hour of tractor operation.



Figs. 7 and 8 . . . **FORCE DIAGRAMS** for tractor-scraper unit on level grade and on downgrade indicate aid by gravity in loading downhill.

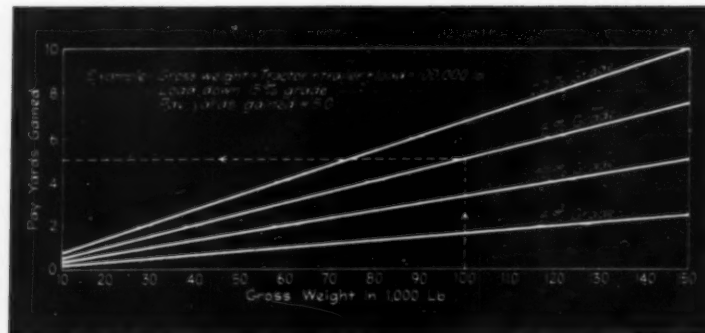
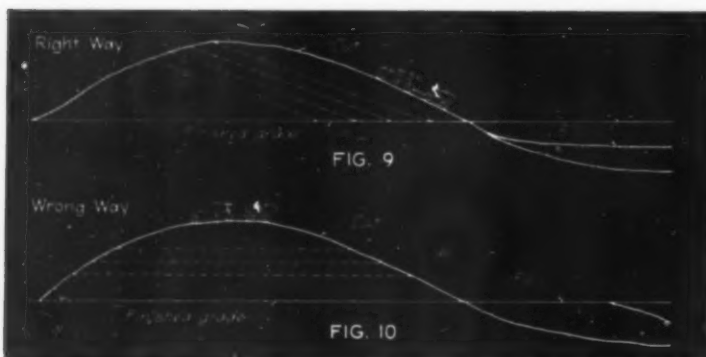


Fig. 11 . . . **DOWNGRADE LOADING** increases yardage pushed into scraper bucket by virtue of additional force furnished by gravity.



Figs. 9 and 10 . . . **BY MAINTAINING DOWNGRADE SLOPE** for loading, tractor-scraper units retain advantage which is lost when level cuts are made.



Figs. 12 & 13 . . . **STEP-PUSH METHOD** of operating pusher tractor to load in both directions in borrow pit eliminates pusher time lost in making return trips and thus increases effective use of pushing unit.

104 yd. per hour. The more efficient method gives an increase of 8 pay yards per hour. On 20c. dirt, this means a saving of \$1.60 an hour, or in 10,000 hr., the life of the machine, \$16,000.

At an ownership and operating cost of \$5 an hour per earthmoving unit, the cost per yard would be  $\frac{5}{104} = 5.2c.$ , or  $\frac{5}{104} = 4.8c.$  The difference represents a saving of 0.4c. per pay yard. Assuming a 200,000-yd. job, the saving would amount to  $200,000 \times 0.004 = \$800$ .

In Fig. 1 a similar line of reasoning shows that two turns can be eliminated, a condition which is likewise true of Fig. 2. Two turns represent 0.5 min. saved. By referring to accompanying charts in Fig. 4, the yardage gained can be determined.

In all the charts of Fig. 4, production figures are based on favorable conditions, in common earth, and on a 60-min. hour, or 100 per cent efficiency. Because of the variance in

job efficiency, the production figures have not been corrected for this factor, which in most cases varies from 80 to 95 per cent.

In addition to the saving gained by eliminating turns, many other factors can be controlled to effect saving of time. Among these factors are:

- (1) Dust abatement for good visibility.
- (2) Well-maintained haul roads to allow machines to operate at rated speeds.
- (3) Haul roads with good alignment, superelevated curves and flat grades.
- (4) Rooters and pushers to speed loading.

Fig. 5 shows the additional distance that can be traveled by making a time saving in other factors of the cycle.

**Rooters**—Rooters in general have been used to break up or loosen hard material for scraper loading, thus making it possible to utilize the scraper method of moving these ma-



**MOBILE CRANE** operated by old gasoline tractor places 6½-ton section of bridge girder.



**AUTO PATROL** maintains fast haul road for pneumatic-tired tractor-scraper units.





**BULLDOZER-ROOTER COMBINATION** operated through double-drum power control unit gives versatility that makes tractor continuously useful for many kinds of work.



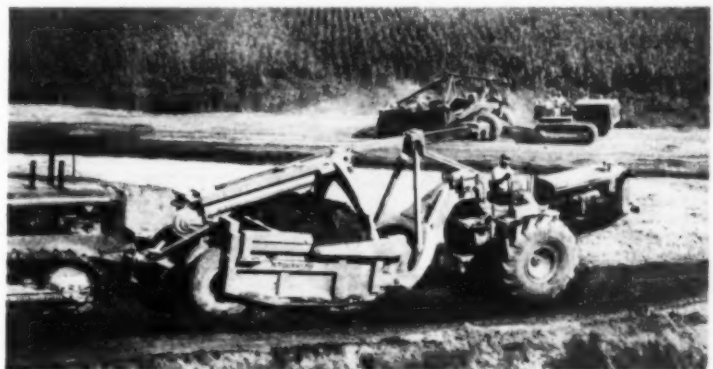
**BREAKING HARD MATERIAL** with tractor-drawn rooters saves blasting and improves scraper efficiency by cutting loading time and increasing loads.

terials at a low net cost per yard. In addition to extending the scraper method to hard materials, the use of rooters decreases loading time and gives larger pay loads for the earthmoving units.

Old tractors can be put to work advantageously to operate rooters. Even though the older tractors have less drawbar pull than the new, they can effect substantial savings in time and equipment wear by pulling rooters to loosen material for scraper loading. By checking the loading time of any scraper outfit in rooted and unrooted material and then referring to the graph in Fig. 4, one can note the increase in production gained by a decrease in cycle time.

By using a double-drum power control unit, an owner can combine a rooter and a bulldozer or angledozer on a tractor. Thus equipped, the machine can be used part of the time to root hard materials and can be employed the remainder

*(Continued on page 122)*



**PNEUMATIC-TIRED EARTHMOVERS** as well as older types of tractor-scraper units can gain added yardage by methods outlined in text.



**LOADING DOWNHILL** in hardpan previously broken up by rooter, 20-yd scraper on this trip is able to get heaping load without pusher.



**USING NO STEEL** except tiebars between adjacent 11-ft. lanes, Michigan constructs concrete pavement of 9-in. uniform depth with dry, 5-sack mix containing small addition of wetting agent. Screw spreader and vibratory finisher handle concrete behind paver.

## LIGHTER, LEANER, DRIER CONCRETE CONTAINS

## *Aerating Admixture*

**MAKING FURTHER APPLICATION OF DESIGN THEORIES** and construction practices previously tested on other experimental projects, the Michigan Highway Department in 1941 let a contract to L. W. Edison, Grand Rapids, Mich., calling for extensive use of mechanical equipment in placing, vibrating and finishing dry, lean-mix concrete incorporating a wetting agent as an admixture. The pavement was laid as part of a \$165,000 contract for construction of a 3-mi. connection completing the Grand Rapids East Belt, third leg of a four-sided bypass highway around the city.

A number of unusual features lend especial interest to the project. Of three types of pavement design on which bids were asked, the lowest bid received was for slab of 9-in. uniform thickness without any reinforcement, and the award was made on this basis. Specifications required that the pavement for the 22-ft. normal width of roadway be built



**27E PAVER** traveling inside forms mixes 32.4-cu ft batches of dry, lean-mix concrete to which wetting agent has been added.



**WETTING AGENT** in water solution is poured from quart dipper on dry batch in mixer skip.

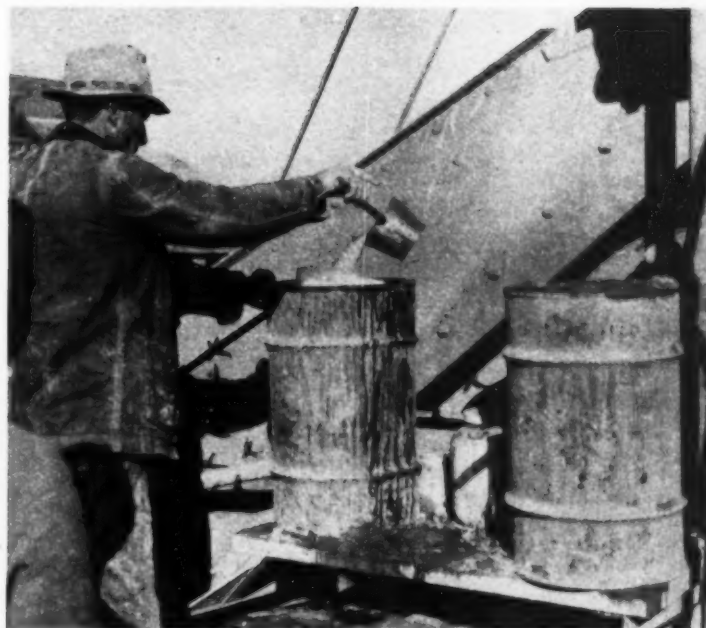




**CONTRACTOR** on \$165,000 grading, drainage and paving job is LEWIS W. EDISON.



**IN CHARGE** of construction operations on the job are HAYNES EDISON (left), brother of L. W. Edison, contractor, and W. D. THEERINGER, project engineer, Michigan Highway Department.



**FOR MAKING WATER SOLUTION** of wetting agent, which comes to job in form of white paste in 12½-lb. jars, workman mixes paste with measured quantity of water in large steel drum. Frothing effect is evident when solution is transferred from one drum to another.

in 11-ft. lanes. The slab rests on a 12-in. sand-gravel sub-base constructed of selected borrow material.

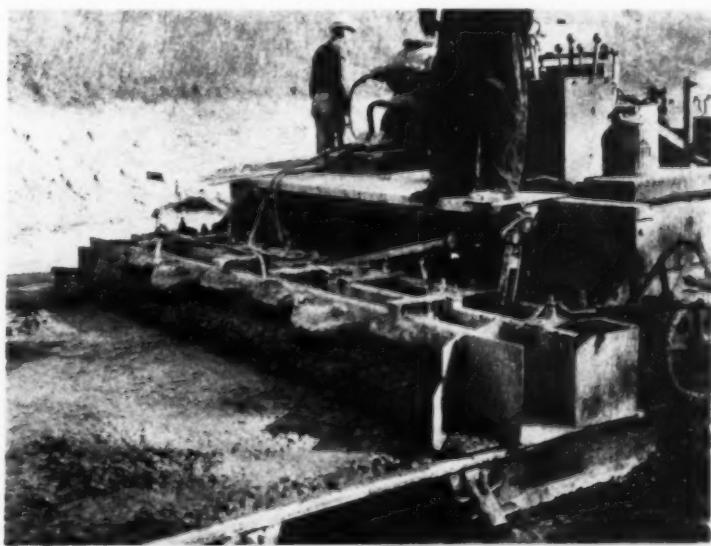
Concrete for the pavement was designed with the object of obtaining maximum durability and satisfactory strength with reasonable economy. The unit price bid for 9-in. uniform-thickness concrete slab (containing no steel except tie-bars between adjacent 11-ft. lanes) was \$1.45 per square yard. To induce certain desired qualities, especially scale-resistance against effects of ice removal salts, in a concrete mix of 1-in. maximum slump containing only 5 sacks of cement per cubic yard, the concrete specification called for the addition to the mix of a "sulphated fatty alcohol" in the pro-



**BEHIND SPREADER** electric vibrator drawing power from generator unit on machine consolidates concrete along edges of slab and adjacent to expansion joints.



**SCREW-SPREADER** distributes concrete and strikes it off to uniform 9-in. depth for 11-ft lane.



**BULLNOSED FRONT SCREED** on finishing machine carries vertical strikeoff board equipped with two electric vibrators powered by generator set mounted on frame of finisher. Slight excess of concrete is carried in front of screed on first pass.



**EXPANSION JOINTS** installed on 120-ft. centers include no dowel bars or other load transfer devices.

portion necessary to produce a prescribed drop in the unit weight of the concrete. Orvus, a sodium lauryl sulphate produced by the Procter & Gamble Co., Ivorydale, Ohio, was the material selected as the wetting and frothing agent.

To obtain the best results with concrete of this design, the specification made certain requirements with respect to mechanical methods of spreading, vibrating and finishing the pavement. Required equipment included a mechanical concrete spreader of the screw-conveyor type, a power vibrator for internal vibration of the concrete along the form faces and adjacent to the expansion joints, and a finishing machine equipped with a vertical vibratory board attached to the front screed.

Except for the tiebars between lanes, no steel was placed in the slab. To form a keyed construction joint between the lanes, inside forms for the first lane were fitted with molded timber strips in which grooves had been cut to hold the bent legs of the tiebars. Expansion joints 1 in. thick, without dowel bars or other load transfer devices, were installed in the slab on 120-ft. centers, with transverse plane-of-weakness contraction joints at 20-ft. spacing between them. The contraction joints likewise had no load transfer devices.

**Concrete Mix**—Accompanying tables give the proportions by weight of the ingredients of the concrete mix and indicate the gradation requirements for the two sizes of coarse aggregate and for the fine aggregate. The mix was designed

(Continued on page 104)



**PLANE-OF-WEAKNESS JOINT** is cut with steel blade in surface of slab behind finishing machine. No steel is placed in concrete under these joints.



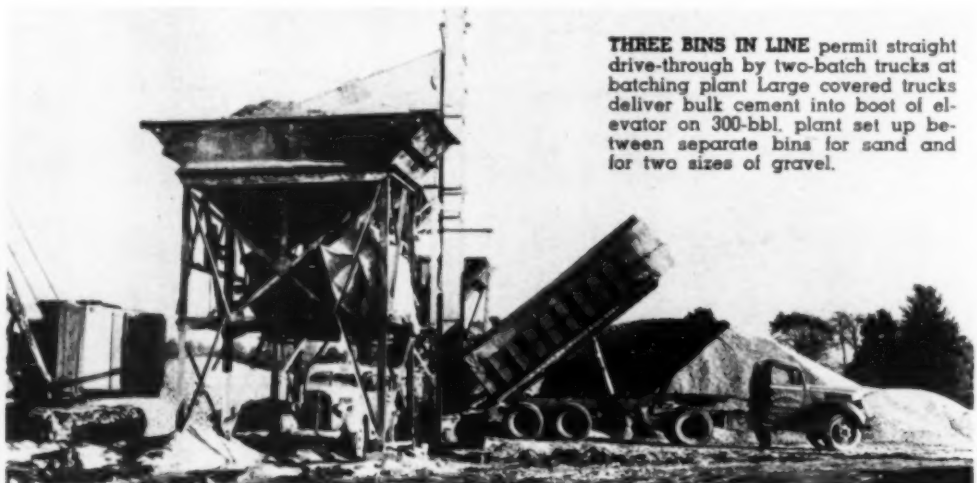
**JOINT SEALING COMPOUND** made up of vulcanized latex, asphalt and hydrated lime is mixed in small four-legged pot at left. Heating kettle in foreground maintains asphaltic oil at proper temperature for mixing.



**WATER HOSE** 200 ft. long connects paver to tee on 2 1/2-in. pipe line in which pressure is maintained by triplex road pump.



**TRANSVERSE AND LONGITUDINAL JOINTS** in pavement are filled with sealing compound after joints have been thoroughly cleaned.



**THREE BINS IN LINE** permit straight drive-through by two-batch trucks at batching plant. Large covered trucks deliver bulk cement into boot of elevator on 300-bbl. plant set up between separate bins for sand and for two sizes of gravel.



# Burma Road

## BUILT BY HAND LABOR TO FORM CHINA'S LIFE LINE

**WITH THE UNITED STATES** now fighting with China against Japan, the Burma Road, vitally important traffic link for the delivery of equipment and supplies from the port of Rangoon over a mountainous route to Western China, assumes new interest for American road builders. Constructed by the primitive hand labor of thousands of Chinese, without the aid of modern equipment, the route extends a distance of about 725 mi. from a railhead at Lashio, northeast of Mandalay, in Burma, across the border to Kunming whence transportation facilities are available to Chungking, China's war capital. The roadway has a width of 18 ft. and for portions of its length zigzags back and forth across rugged terrain to provide grades not too steep to stall trucks.

Since the Japanese invasion in 1937 engineers in Free China, according to information received by United China Relief, Inc., have constructed during the last four years about 50,000 mi. of road through previously untouched and isolated wastelands in the country's western provinces. Because of its strategic importance, the first job undertaken as part of this highway program, was the construction of the Burma Road, winding from India into South China through malaria-infested plains and mountains and completed in a year and a half. The accompanying photographs show scenes on the route that is referred to as "China's life line".

Construction of highways through the Northwest, to connect China's war capital with Eastern Asia, was started next. On this project more than one million farmers, soldiers, peasant women and boys, using little modern machinery, built about 3,000 mi. through rocky, mountainous country, using picks and shovels for the most part. This route had to be carried over 5,000-ft. mountain passes.

**EARTH FOR EMBANKMENT** (below) is dug by thousands of Chinese coolies using picks and shovels.



**SERPENTINE ROUTE** is followed by Burma Road to provide grades through Yunnan Province that will not stall motor trucks crossing mountainous terrain characteristic of this region.



**HAND LABOR** by thousands of Chinese built Burma Road without aid of modern mechanical equipment.

**MOUNTAINOUS CHARACTER OF COUNTRY** (below) requires frequent curves in alignment of route with width of only 18 ft.



## White Cement Floor LAID TO REFLECT LIGHT FOR AIRCRAFT



**IMMENSE FLOOR AREA** of 4,000x320-ft. bomber plant in Texas is scene of paving operations where 3,500-ft. length of 200-ft.-wide main assembly aisle surfaced with light-reflecting white cement topping  $\frac{3}{8}$  in. thick on  $5\frac{1}{2}$ -in. base of gray concrete. View shows steel reinforcement and service ducts in place, ready for pouring of concrete.



**WHITE CEMENT MORTAR** top course on gray concrete base is struck off to specified  $\frac{3}{8}$ -in. thickness by wood templates riding on pipe screeds set to proper grade.

**TO REFLECT LIGHT** upon the under sides of the huge wings and fuselages of bomber planes during the course of their assembly, a surface layer of white cement mortar over a gray concrete base has been applied to a floor area 200 ft. wide and 3,500 ft. long in the main aisle of the big steel-frame building which The Austin Co., engineers and builders, of Cleveland, Ohio, has recently completed at Fort Worth, Tex. Here four-engined bombers for Army use will be produced by the Consolidated Aircraft Co. As previously described in *Construction Methods*, (December, 1941 issue, p. 50) the main building of the bomber assembly plant is 4,000 ft. long and 320 ft. wide, so that the provision of a floor for the structure was a full-sized paving operation.

The light-reflecting white cement floor surface is applied only to the 200-ft.-wide main aisle, starting at a point 500 ft. from the south end of the building and extending 3,500 ft. to the north end. Over the remaining factory build-

(Continued on page 110)



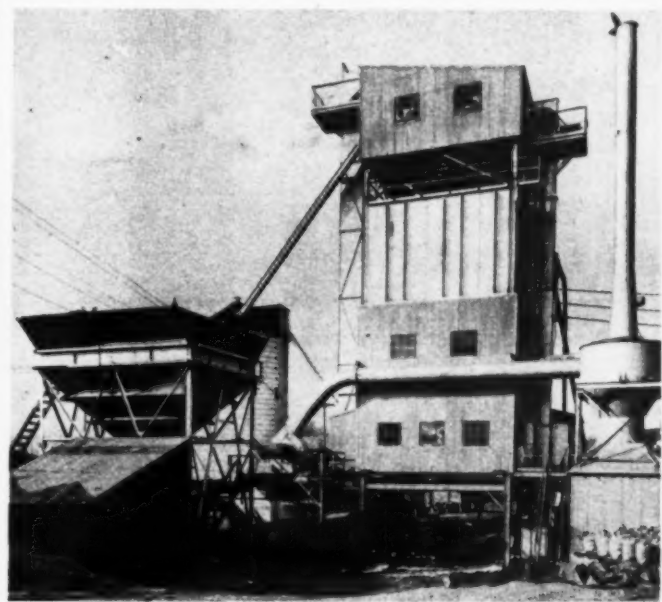
## ASSEMBLY IN BOMBER PLANT



**PRELIMINARY FINISHING** is done with gasoline powered Whiteman machine equipped with three rotating trowel blades.



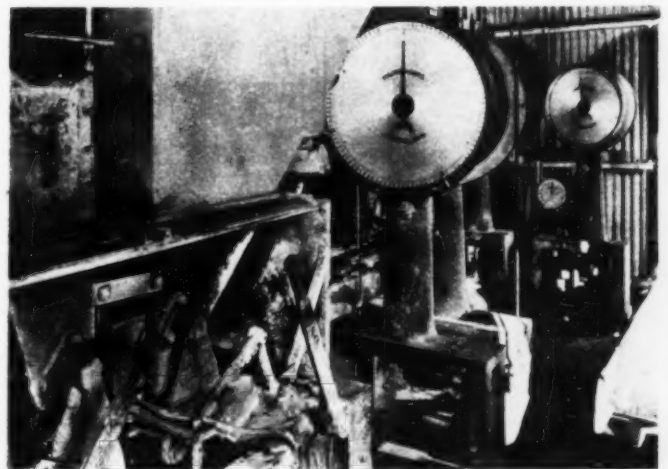
**FINAL FINISH** is done with hand floats by workers operating from wood pallets to protect surface from damage. In background a lane of white mortar surfacing, delivered by wheelbarrow from mixer, is being struck off with wood template.



## *Weighing Equipment* Speeds Paving-Mix Plant Production

**AN EXAMPLE** of the utilization of modern weighing equipment is found in the plant at Bedford Hills, N. Y., of the Westchester Colprovia Corp., manufacturer of a tight cold-mixed asphaltic paving material. Because of its specially designed equipment, this plant requires only 8 men to operate, although it has a capacity of 85 tons per hour with 7 different mixes being manufactured each day. Weighing equipment includes six Fairbanks suspended pipe lever hopper scales, all equipped with dials. Two have 25-in. dials and four have 20-in. dials, each dial being furnished with outside spring clip markers in red, white and blue to represent the different aggregates. All the dials are mounted on tall pillars and set on fabricated steel shelves to facilitate easy reading.

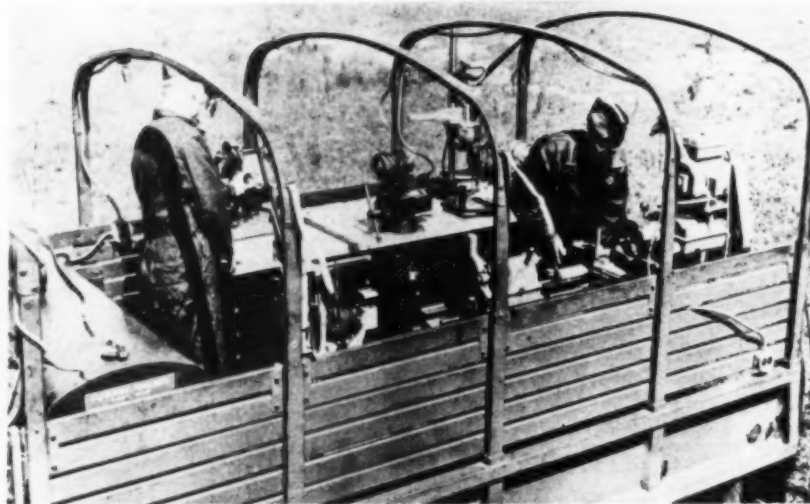
Inasmuch as the scales were designed for installation in close quarters, it was necessary to utilize special suspension rods and stiffeners to absorb a great amount of vibration caused by the operation of various mixers and batchers.



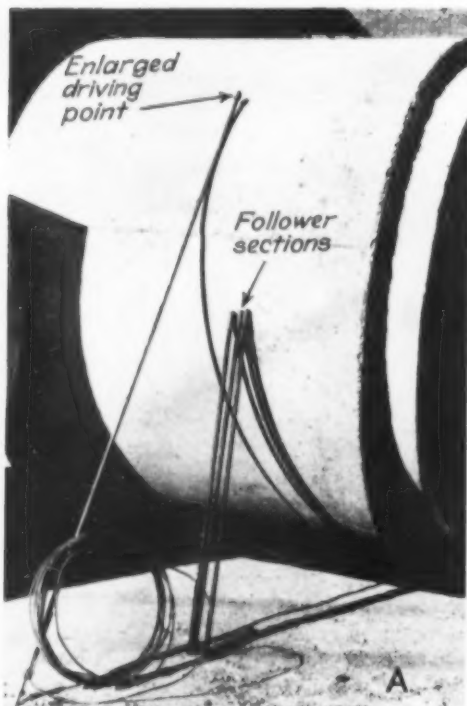
**ASPHALT PLANT (above)**, with capacity of 85 tons per hour, is equipped with this modern weighing equipment to produce seven different mixes for paving purposes.

# HOW

## They Did It CONSTRUCTION DETAILS For Superintendents and Foremen



**ARMY SHOP TRUCK**, for making repairs to equipment in field, is equipped with Hobart arc-welder and power generator, lathe, brake reliner, valve surfacer, vise, drill stand and grinder. All tools and lights are powered by auxiliary power generator in welding unit.



**TESTING SOIL CONDITIONS** for sub-station grounding at Willow Run bomber plant to be operated by Ford Motor Co., near Ypsilanti, Mich., Detroit Edison Co. utilizes method developed by Testing Division of its Electrical Systems Department. Test ground rod (A) of 1/2-in. diameter copper 6 ft. long, with wire lead brazed on, is driven to necessary depth with Barco gasoline hammer (B) by adding as many iron follower sections 1/2-in. diameter by 3 ft. long as required (C). Enlarged point on ground rod facilitates driving. Using Megger ground resistance tester, crew measures both short-circuit current and resistance to determine grounding necessary for sub-station.

**AIR RAID SHELTER** capable of protecting 30 people is made of Armco multi-plate corrugated galvanized metal covered by earth blanket and sand bags. Measurements are 12 ft. 6 in. wide at base, 30 ft. long, and 8 ft. 4 in. high at center. Plate steel is 1/4 in. thick, with 1 1/2-in. deep corrugations spaced 6 in. on centers. Weight of metal, 10,000 lb.

**HIGHWAY ATOP DAM CREST (below)** is paved with concrete as final stage of U.S. Bureau of Reclamation's 10,500,000-cu yd. Grand Coulee structure across Columbia River in Washington. Workers of Consolidated Builders, Inc., vibrate concrete poured into forms and screed surface with heavy timber strikeoff. Reclamation Bureau has announced that motor traffic will not be allowed to cross dam on new highway during present national emergency.



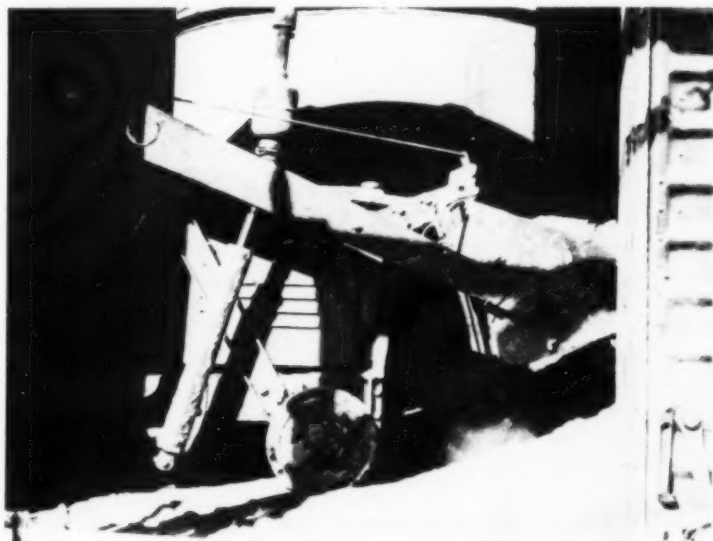




**FALSE BOTTOM** in form of steel sheet attached by chains to front of body of 8-cu.yd. Hug end-dump truck insures rapid and complete discharge of load. As body is raised into vertical position for dumping, false bottom, hung only from front end, slides toward rear end of truck and breaks loose earth or other material. This device is in use on trucks of William Lathers, Jr., contractor, of Madison, Wis.



**SAND TRIPPER** on line of belt conveyor delivering concrete aggregates for Shasta Dam, U.S. Bureau of Reclamation project in California, diverts material to stock piles.



**UNLOADING OF BULK CEMENT** from box cars to silo at Navy drydock job is done with aid of Butler Bin Co. machine called "cement hog," powered by 25-hp. gasoline engine and equipped with boom and dipper. From timber platform machine moves into car and trundles out 8- to 11-cu.ft. loads of cement which are dumped into hopper for delivery to silo by screw conveyor and bucket elevator.

**PUMPED CONCRETE (below)** is delivered through pipe line to seal first of three temporary diversion conduits through which San Joaquin River once flowed through base of Friant dam, U.S. Bureau of Reclamation structure in California. After temporary outlets are plugged, four permanent outlets embedded in concrete structure will carry river flow.



**TRACTOR-DRAWN CRANE** on pneumatic-tired mounting unloads clam-shell bucket at March Field in California. Le Tourneau unit has all-welded tubular frame, while Caterpillar tractor is equipped with front-end power control unit and frame for quick mounting of bulldozer.

**ADDITIONAL STORAGE SPACE (below)** for bulky patterns at busy plant of R. K. LeBlond Machine Tool Co., Cincinnati, Ohio, where ground space is at a premium, is provided by topping row of garages with lightweight structure of Steelex panels, prefabricated by American Rolling Mill Co. Added structure is 17 ft. high with steel roof deck covered by insulating board and waterproofing.



# Heavy Grading

## In Deep Cuts Required for \$4,000,000 Freeway Extension in California



**DEEP OPEN CUTS** with side slopes of 1 on 1 are main construction features of new 4-lane express route for southbound traffic only, paralleling existing highway tunnels (shown at left) on road that will be used henceforth only by northbound traffic.



**GRADE SEPARATION**, one of many on route, is effected by Park Row concrete arch bridge. In foreground, tractor-bulldozers and sheepfoot rollers are spreading and compacting earth for subgrade.



**STEEP SLOPE OF CUT** terminates in masonry toe wall, seen in left foreground.

**DEEP CUTS** of as much as 175 ft. through earth and rock, in addition to other heavy-duty grading operations, characterized the construction of a 1.8-mi. extension of the Arroyo Seco freeway south through the hills of Elysian Park and into the business district of Los Angeles, Calif. The express route with no crossings at grade, designated by the War Department as part of the national strategic system of highways between Los Angeles and Pasadena, and certified as a national defense project, was granted priorities for deliveries of steel, cement and other construction materials. The extension was undertaken to relieve traffic bottlenecks at an existing bridge crossing the Los Angeles River and through four highway tunnels in the Elysian Park area.

Jointly sponsored by the California Division of Highways, the City of Los Angeles and the Work Projects Administration, the project called for a four-lane roadway with grade separations and bridges paralleling Figueroa St., for southbound traffic only, through open cuts in Elysian Park on the west side

(Continued on page 100)





**EXCAVATION OF DEEP CUT** is done with power shovel loading into end-dump trucks. While slopes are trimmed by hand labor, tractor-bulldozer spreads material for subgrade.



**BOTH HAND LABOR AND POWER EQUIPMENT** are used on one of the deep cuts of the Arroyo Seco freeway extension.



**BRICK PAVEMENT** is laid on widened roadway divided by white cement median strip. View shows following operations, starting in foreground and working toward background: Laying brick on bedding course; batting; culling; replacement; rolling; applying separating agent for excess joint filler; applying asphalt joint filler; removing excess filler; heating asphalt filler in kettles. Cushion material is straightedged and checked before laying of brick.

## *Light Reflecting Surfaces* of White Cement Applied to Median Strips on Brick-Paved *Strategic Highway*

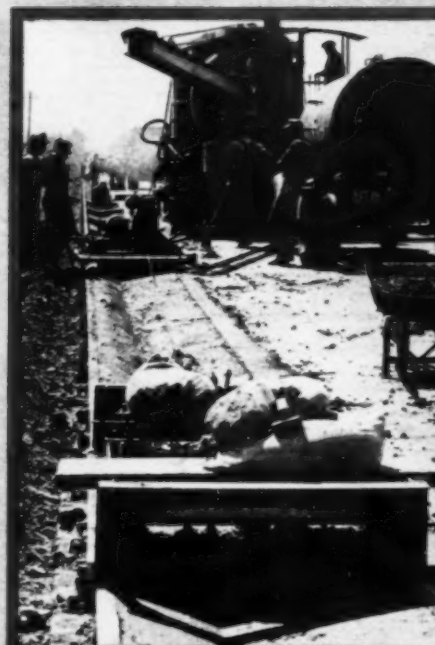
By C. R. HANES

Field Engineer, Bureau of Construction,  
Ohio Department of Highways

**FORMING AN IMPORTANT LINK** between the steel producing centers of Pittsburgh and Youngstown, through the rubber center of Akron, to the manufacturing centers at Toledo, Chicago, and Detroit, Route 18 from U.S. 20, at Norwalk, easterly through Medina, Akron and Youngstown, to Pittsburgh, Pa., has assumed a position of major importance in Ohio's system of strategic highways to serve the needs of a nation at war. It has been necessary, therefore, to re-

build, widen and pave an 11.783-mi. section between Medina and Akron. Features of the improvement are the use of light-reflecting surfaces of white cement along median strips separating the traffic-ways and a large area of brick paving with bituminous joint filler. Route 18 also intersects Route 14 and U.S. 42 of the strategic network into Cleveland areas and makes connection between the Ravenna Ordnance Plant and the Plum Brook Arsenal at Sandusky. Even before

**CONTRASTING GRADES** (below) of parallel lanes are shown by new westbound roadway, at right, and old route, at left.



**1 SEPARATE GUTTER** is constructed with aid of strike-off units pulled by paving mixer to shape section.



**2 IN BUILDING MEDIAN STRIP**, gray concrete is first chuted from truck-mixer into 7-in. forms blocked to grade. Joints spaced 10 ft. apart.



**3 WHITE CEMENT CONCRETE** is struck off to form 1-in. thick surface over gray concrete.





**4 SCORED REFLECTING SURFACE** of white concrete is formed by special tools designed especially for this job.



**5 FROM CONTROLLED GUIDE** center of strip is floated to produce uniform alignment.



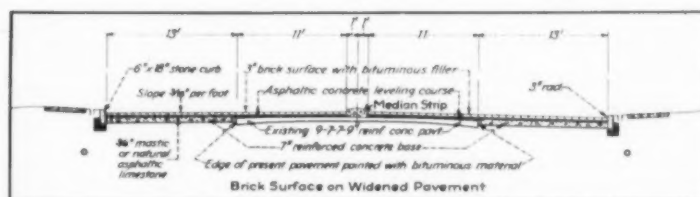
**6 CIRCULAR END** of strip is fluted with radial strike-off from template set on forms. Metal center markers control radius.



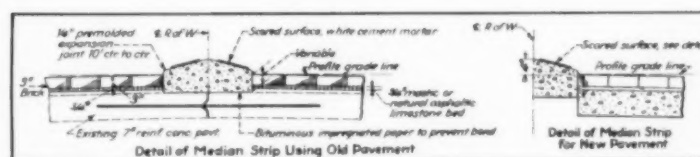
**WIDENED ROAD**, with median strip, ready for paving. Inner lanes are old concrete pavement brought to uniform grade by asphaltic leveling course. New concrete base forms outer lanes.



**HOT ASPHALTIC LEVELING COURSE** is laid over old concrete pavement to provide uniform bed for new brick surface.



**TYPICAL CROSS-SECTION** of brick surface on widened pavement.



**DETAILS OF MEDIAN STRIP** on old and new pavement. White cement mortar surface is scored to reflect light.

**ASPHALT JOINT FILLER** (below) from heating kettles is applied to surface of brick pavement.



the present accelerated demands of national defense, sections of this route were inadequate and required extensive rebuilding.

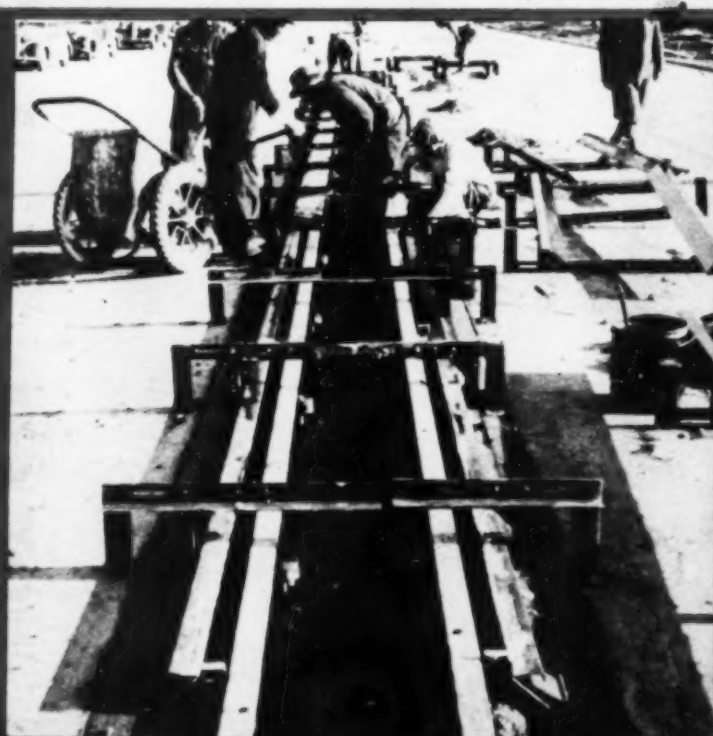
The 11.783 mi. length selected for improvement between Medina and Akron was divided into three contracts. The first contract, let in November 1939, consisted of a 6.244-mi. section in Medina County; the next was a 2.254-mi. section in Summit County. As the original Medina County section had good alignment, the improvement consisted of adding a 22-ft. westbound strip to the north of the existing 18-ft. pavement. Approximately 50 ft. separated the center lines

of the old and new pavements, providing a median strip. The variation in grade lines of old and new paralleling construction, from old pavement 10 ft. lower than the new to new pavement 15 ft. lower than the old, provides interesting comparison of highway standards.

The 2.254 mi. in the Summit County section had undesirable grade and alignment features which made it necessary to construct a new 22-ft. lane with 9-ft. median strip for a distance of 0.829 mi. of the 2.254-mi. total. Further failures in the old pavement left in place and increasing traffic demands warranted rebuilding the remaining 1.425-mi. section



**1 PANEL MEDIAN STRIP** from Route 176, westerly to full new concrete section has main body of gray concrete placed from truck-mixer.



**3 FACE FORMS** for white cement mortar are set in place after gray concrete has been struck off. Forms are suspended from adjustable-width bridges.



**2 STRIKE-OFF TOOL** operated from top of form to pavement surface shapes gray concrete before application of white cement veneer.



**4 METAL INSET PANEL** is oiled before being placed in face form to produce recessed light-reflecting surface.



**5 WHITE CEMENT MORTAR** is placed between face forms and gray concrete spading well.



of the south lane of this section during the 1941 construction season. A 3-ft. depressed gutter adjoining the edge of the pavement on reduced grades was constructed in a novel manner. Because more than 31,000 lin.ft. of this type of gutter was required, the contractor used a regular paver, operated from the surface of the pavement, from which two strike-off units were pulled by cable to rough-shape the section. A vibrator was carried on the first unit to facilitate placing. Regular edge curb was constructed integrally with the pavement on grades of 2 percent and more.

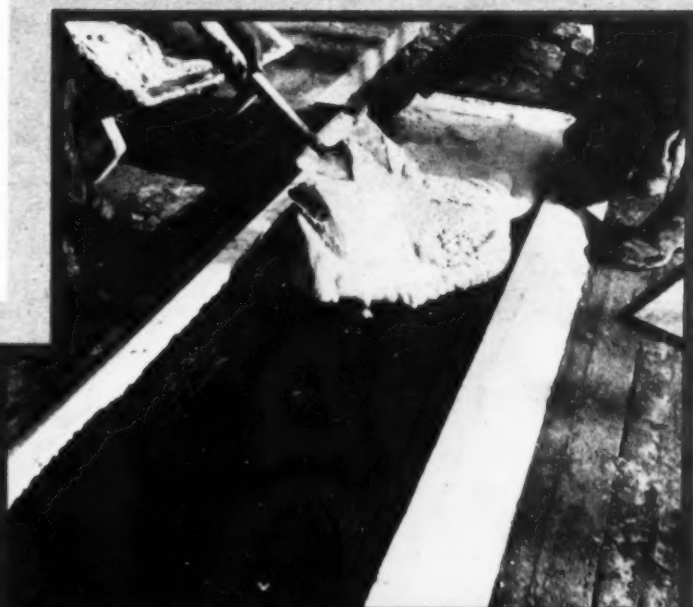
(Continued on page 78)



**6 FINISHING TOOL SMOOTHS** sloping surface of strip after removal of face forms. Plain faced sections 20 ft. 2 in. long occur between lengths with impressed surfaces.



**7 AT END SECTION** forms are removed showing recessed surfaces to reflect light.



**8 WHITE CEMENT TOPPING** is spread on gray cement main body of median strip.



**9 MAGNETIC IRON OXIDE** is applied to top surface of separating strip at rate of 3 lb. per 50 sq. ft.



**10 CONTRASTING COLORS** of black top and white side walls enhance visibility of separating strip. Worker is floating surface after iron oxide has been silted on, darkening concrete to depth of  $\frac{1}{4}$  in.

# Central Plant Produces *Tar Concrete* For Surfacing 23 Mi. of STABILIZED BASE



**TWO CONTRACTS** for 23 mi. of stabilized base and tar concrete surface are built by J. P. HUMPHRIES (in plaid shirt), contractor, Milwaukee, Wis., who here takes a look at the job with JOHN R. MCGUIRE, assistant construction engineer, Wisconsin Highway Commission.



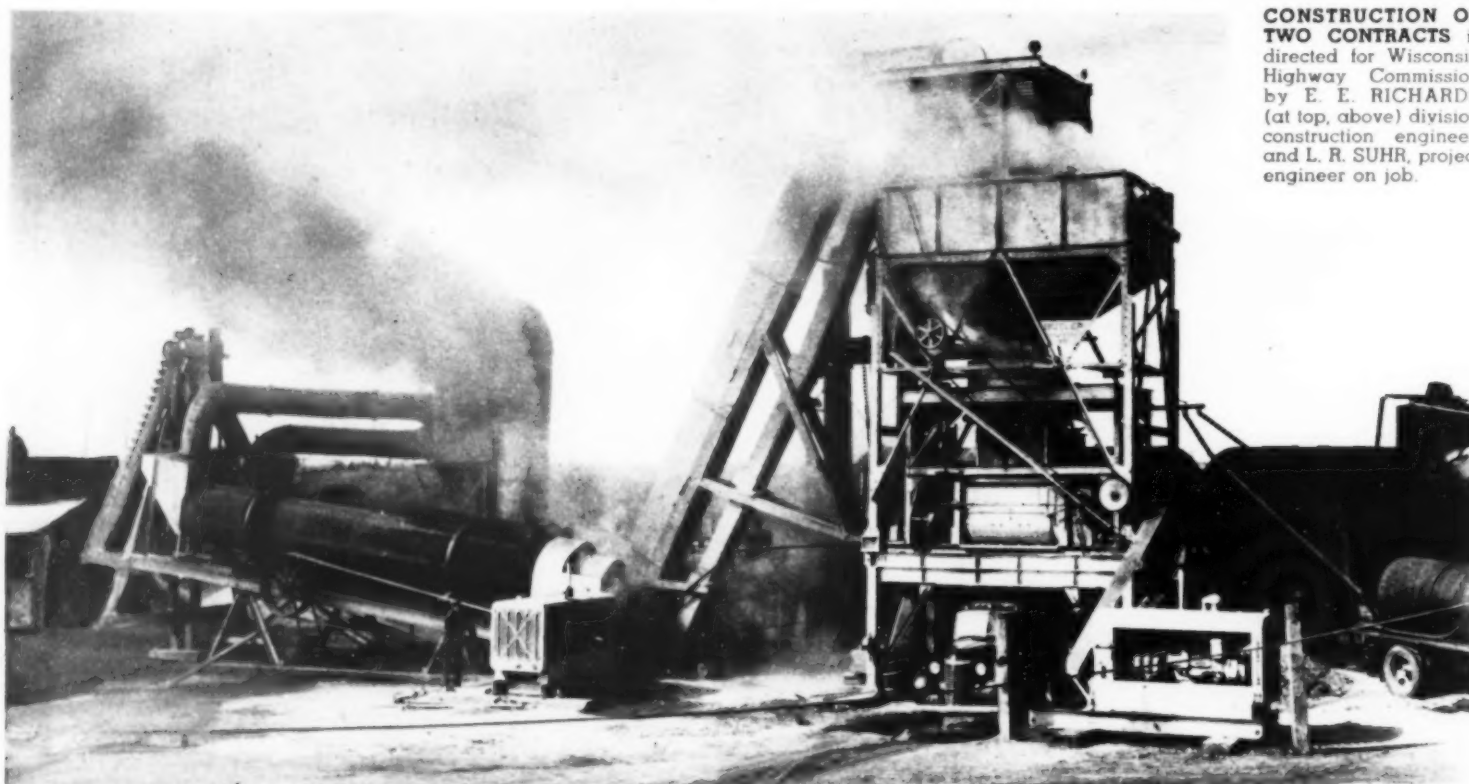
**JOB OPERATIONS** are under constant supervision of J. C. SEUAL, superintendent for J. P. Humphries, Inc.

**TO SUPPLY HOT TAR CONCRETE** to two black-top pavers laying parallel 11-ft. lanes of 22-ft. surface course 1½ in. thick, J. P. Humphries, Inc., contractor, Milwaukee, Wis., last summer set up in a 2½-mi. gap at Montfort, Wis., between adjacent contracts totaling 23 mi. on U.S. 18, a skillfully contrived bituminous mixing plant. The plant was equipped with a 2½-ton twin pugmill which turned out open graded mixture to specifications of the Wisconsin Highway Commission on a 50-sec. mixing cycle at rates up to 110 tons per hour and 810 tons per 8-hr. day, the latter quantity being sufficient for construction of 4,400 lin.ft. of pavement. On both jobs, the surface course went on top of dense, stabilized, soil-aggregate base course, made up of properly proportioned graded aggregate and binder put down in 3-in. maximum compacted layers to variable total depths of 2 to 8 in. as required to build up and strengthen the existing traffic-bound road. The stabilized base was constructed to a full roadbed width of 41 ft. and to a crown section 36 ft. wide providing 7-ft. shoulders on both sides of the 22-ft. pavement.

Both contracts, embracing in all nearly 67,000 cu.yd. of base course and 298,000 sq.yd. of surface course, were awarded June 17 on a pair of low bids totaling less than \$196,000. With the State Highway Commission supplying the tars for base prime, hot mixture and surface seal, the unit prices for 1½-in. surface course, including application of prime, seal and cover stone, were 34c. per sq. yd. for the longer



**CONSTRUCTION OF TWO CONTRACTS** is directed for Wisconsin Highway Commission by E. E. RICHARDS (at top, above) division construction engineer, and L. R. SUHR, project engineer on job.



**LARGE-CAPACITY CENTRAL PLANT** equipped with twin dryers and 5,000-lb. mixer produces open graded tar concrete for 1½-in. surface course on 23 mi. of Wisconsin highway. Two diesel power plants drive moving parts of plant.





**ROLLERS SLIGHTLY SKEWED** carry 48-in.x32-ft revolving dryers on steep pitch in practically constant equilibrium. Drum tires rarely come in contact with thrust rollers.



**DUMP BODY** of truck backed between front drive wheels of paving machine discharges 5-ton load of hot tar concrete into receiving hopper as paver pushes truck ahead.



**HAND RAKING, TAMPING AND LUTING** smooth pavement edges and joint between two 11-ft. lanes. Tracks in freshly struck off tar concrete of second lane indicate partial compaction by rear-drive rollers of paver.

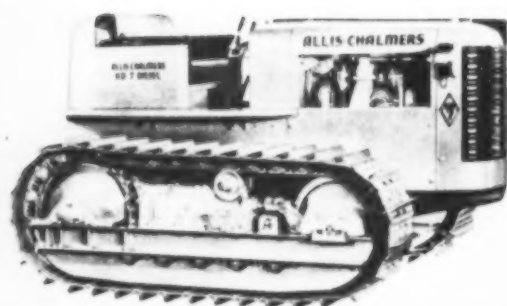
14.26-mi. job to the east, and 35c. for the shorter 8.82-mi. job to the west.

By virtue of his close bidding on the two contracts, within 2.25 percent of the second bidder on one tender and within 3.33 percent on the other, Joe Humphries was in a position to pave in both directions toward a central mixing plant located on a railroad siding in the gap between the projects. Stipulations that the shorter job be completed in 85 days after notice to proceed and that the longer job be completed in 100 days necessitated for the central set-up a plant capable of producing more than 22,000 tons of tar-concrete in the relatively short working time that would remain after base construction had made sufficient progress to permit full-time paving operations. Ability to provide such a mixing plant and two machines for laying pavement was a basic factor in figuring the bid prices and in obtaining the contract awards.

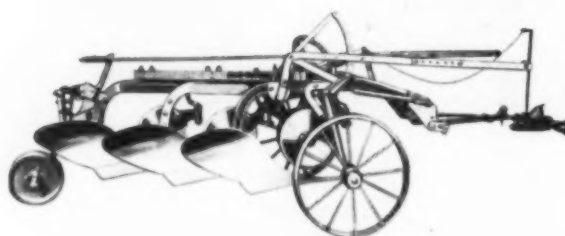


**TANDEM 8-TON ROLLER** completes compaction of 1½-in. tar-concrete surface course by working across pavement in overlapping longitudinal trips from beginning edge to opposite edge

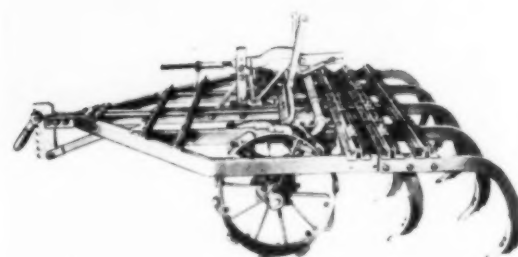
# Heavy-Duty Tools That ON SOIL-CEMENT



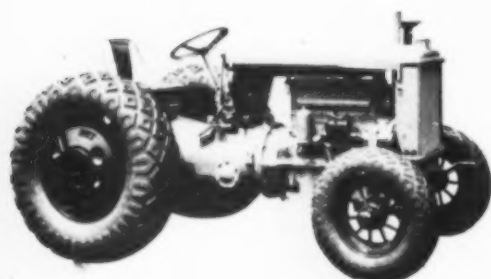
HD-7, 60 drawbar h.p., 2-cycle Diesel tractor. Other models, gas and Diesel, 33 to 132 h.p.



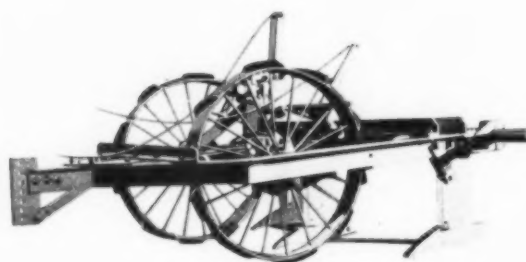
A-C high speed plows provide good mixing action and assure uniform sub-grade.



Extra heavy weight chisel for light ripping, mixing and pulverization. Depth control.



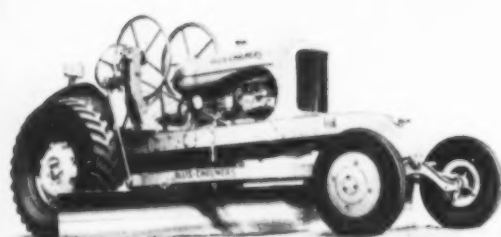
A complete line of wheel tractors for pulling mixing tools, water spreaders, etc.



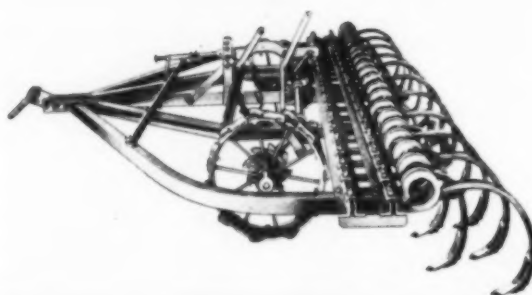
A-C sub-grader scarifies hard surfaced roads and maintains level sub-grade. Depth control.



1000, 1200, 1500 gallon capacity, Gunnison pressure water spreader with volume control.



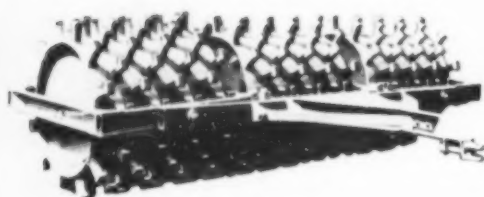
Model W-Speed Patrol for pulling-in edges, shaping and finishing. 10' blade, hand control.



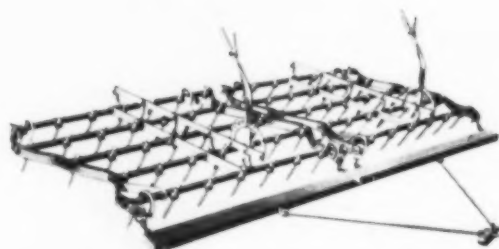
Big, heavy-duty, soil-cement mixer with flexible coil shank teeth. Depth control.



Extra heavy, offset disc harrow for pulverization and mixing. Easy turning, depth control.



Faster and better compaction with heavy, Gar Wood roller. Available in sections.



All-steel spike tooth harrow for leveling cement and producing surface mulch for rolling.



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... OUR FIRST LINE OF DEFENSE



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## STABILIZATION

Here are the kind of tools you need for soil-cement stabilization—long-wearing ... tough ... powerful ... economical! Tools that have had years of service under the most difficult conditions on every type of soil. Tools that have proved they can handle any soil-cement mixture in stride—loam, clay, sand or gravel. A wide selection ... from one source! One supplier ... one service! Rippers, chisels, discs, scarifiers, plows, water spreaders and spike tooth harrows, for pulverizing, rooting, mixing, watering ... sheep foot tamping rollers, motor graders, wheel and crawler tractors for compacting, grading and drawbar work! For complete information write for booklet: "Allis-Chalmers Equipment For Soil-Stabilization."



# ALLIS-CHALMERS

TRACTOR DIVISION - MILWAUKEE - U. S. A.

# POWER

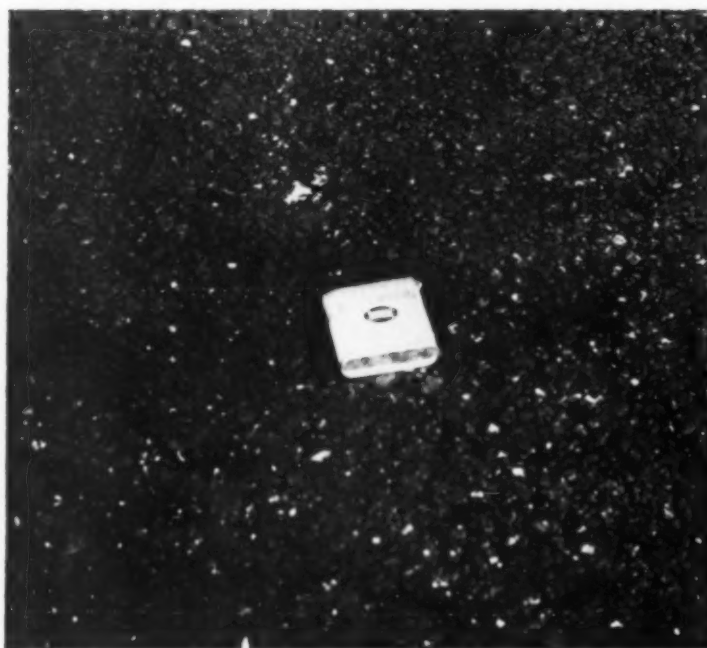
IT DOESN'T COST ... IT PAYS!

*Get all the facts*

Write for this new booklet ...  
"Equipment for Soil-Stabilization."

Base construction was sublet to two subcontractors, Stewart Watson, of Barneveld, Wis., on the 14.26-mi. contract, and P. W. Ryan Sons, Janesville, Wis., on the 8.82-mi. project.

**Mixing Plant**—Tar concrete was produced in the large volume required by a Hetherington & Berner 5,000-lb. twin pugmill mixer of the run-around type, designed to move materials longitudinally as well as transversely in the drum, thus eliminating dead spots and assuring uniformity of product. A 65-hp. horizontal fire-tube boiler heated the tar to the relatively low temperature of about 200 deg. F. needed for this material. The tar was pumped from tank cars to the weigh bucket



**OPEN GRADED TAR CONCRETE** presents coarse texture which will provide excellent non-skid quality even after application of tar seal and cover stone.

by a Worthington duplex steam pump.

On top of the frame supporting the mixer, the steam-jacketed tar bucket and the weigh box for aggregates, the contractor erected salvaged bins of a Butler bulk-cement plant. A No. 4 screen mounted on the steel bin received hot materials delivered by bucket elevator from the dryers and classified the graded aggregate into two sizes in separate bin compartments for individual cumulative weighing on a Kron dial scale. Dust recaptured from the dryer by a dust collector could be added to the aggregate in the bins by a separate elevator when required. A 5,000-lb. batch comprised

(Continued on page 93)



**STABILIZED MATERIAL** comprising graded limestone and pulverized shale is thoroughly mixed in windrows on road by Caterpillar motor patrols before being spread for compaction.

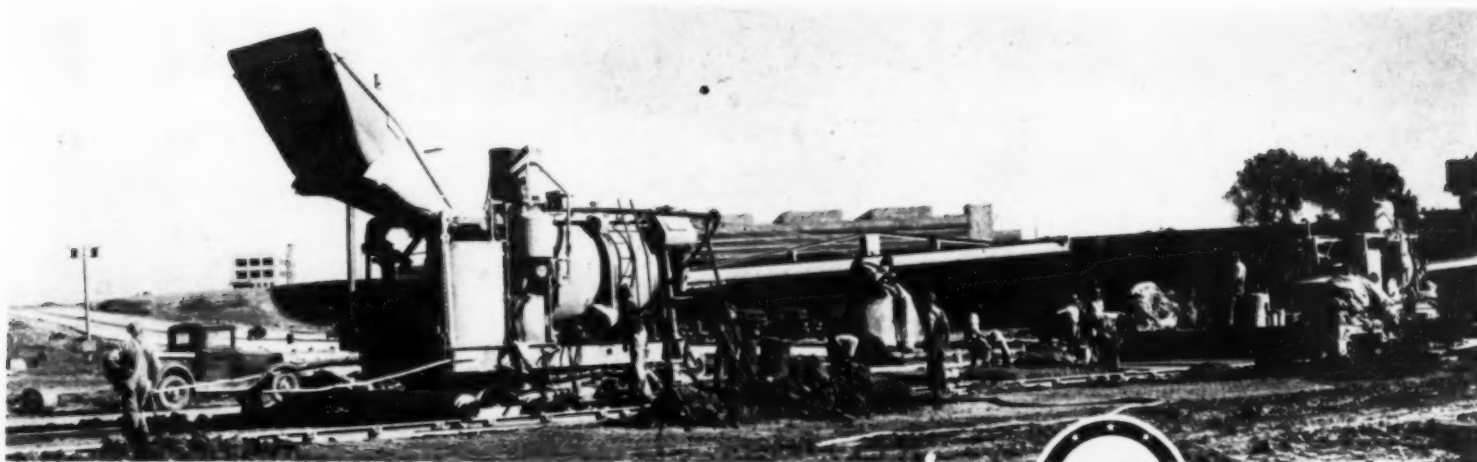


**NINE-WHEEL PNEUMATIC-TIRED ROLLER** so designed that front and rear wheels travel in different tracks compacts stabilized, graded aggregate base in layers of 3-in. maximum compacted thickness.

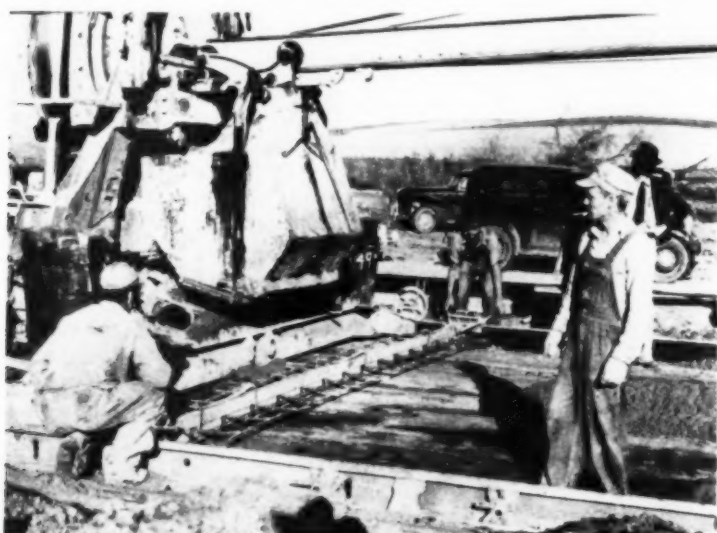


**EDGE OF STABILIZED BASE** gives some indication of densities ranging from 140 to 145 lb. per cu. ft. obtained by compacting mixture containing natural moisture close to optimum.

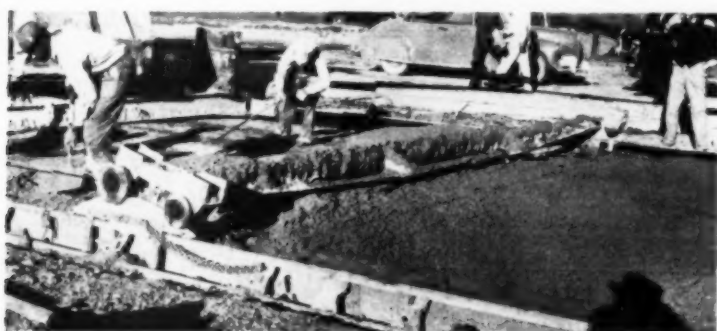




**AGAINST BOMBER PLANT BACKDROP**, 34E dual-drum paver places concrete in 22-ft. roadway of divided four-lane highway, while smaller mixer at right waits its turn to fill in on special paving jobs. In left background is access road into Fort Crook.



**EXPANSION JOINT ASSEMBLY** 22 ft. long is placed with aid of two plow-handle attachments which hold it in position until stakes can be driven.



**WOODEN ARCHES** set on forms carry paver-operated strikeoff across expansion joint. Strikeoff levels concrete 2 in. below finished grade for reinforcing mesh.



**TWO-SCREED FINISHING MACHINE** strikes off top 2-in. course of concrete covering reinforcing mesh.

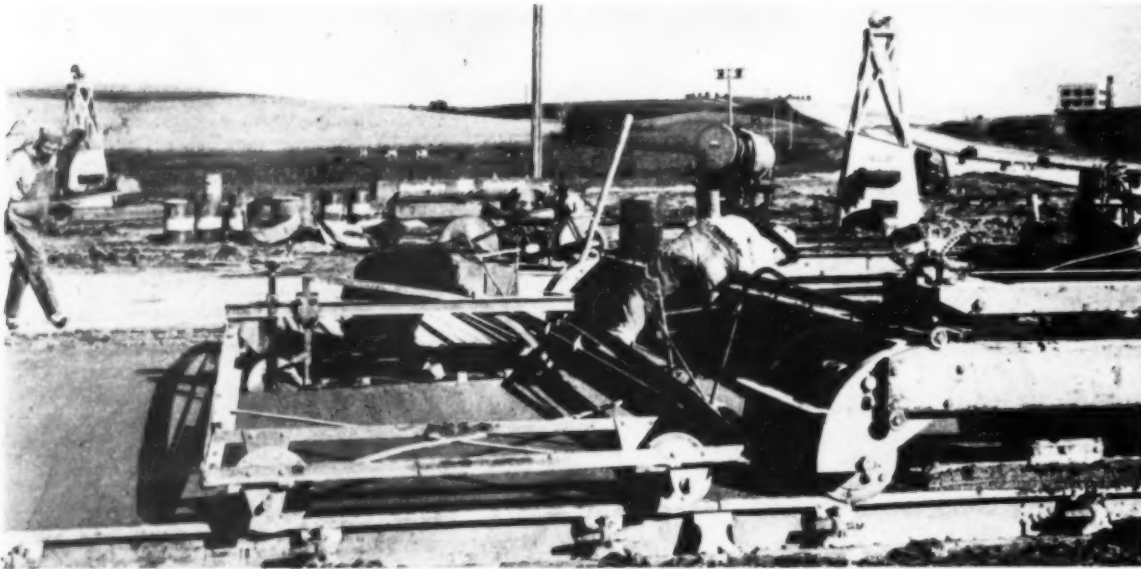
## Defense Traffic Served

By Revamping

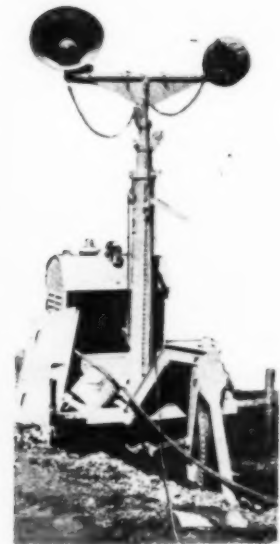
## Omaha-Fort Crook Road

**FOREHANDLEDLY PREPARING** to take care of tremendous additional traffic volume which was bound to result from construction of a huge Martin bomber plant at Fort Crook, Neb., where the Army already had established a reception center and a motor transport school, the Nebraska Department of Roads and Irrigation early last summer awarded to the Western Contracting Corp., Sioux City, Iowa, and the Peter Kiewit Sons' Co., Omaha, a \$575,000 contract calling for complete revamping and double-tracking of a 5-mi. stretch of U. S. 73-75 between Omaha and the military reservation. Speed in construction was essential if the highway was to be ready to meet the inevitable traffic demands, and the contract required completion of all features of the work, including more than 535,000 cu.yd. of excavation and 156,000 sq.yd. of reinforced-concrete pavement, in 90 working days after the designated starting date of June 30. By operating extensive earthmoving equipment and a flexible two-mixer paving plant on a three-shift basis six days a week, the contractors completed the heavy grading by the first week in September and the major pavement for the divided roadways about one month later. Because of the importance of the highway, it received the same A-1E priority rating as the bomber plant.

Each of the two firms in the contracting combination was well qualified and equipped to handle its proper share of the project, and the job was accordingly split between them, with



**AHEAD OF LONGITUDINAL FLOAT.** center-line joint machine opens longitudinal slot with wheel cutter to allow insertion of bituminous filler.



**ROLLING LIGHT PLANTS** for paving work are equipped with adjustable telescopic masts which are elevated either by jacking lever, as shown, or by hand winch.



**COLORLESS MEMBRANE** to seal pavement surface for curing is sprayed on concrete immediately after final finishing.

the Peter Kiewit Sons' Co. doing the grading and the Western Contracting Corp. placing the pavement. Moving its grading equipment into the project after prior service on the bomber plant site and an adjacent highway, the first-named firm had grade-building operations well under way by July 11. During the next four weeks its tractor-scraper, elevating grader and pneumatic-tired trailers moved material at rates up to and exceeding 20,000 cu.yd. in a 21-hr. day of three 7-hr. shifts. Skid-mounted light towers supplemented the lights on the equipment in providing night illumination.

Main-line paving operations started Aug. 8, when the second partner began placing slab with a Koehring 34E dual-drum mixer brought in from the adjacent highway previously mentioned in connection with the grading equipment; the same two firms in combination had built this road under a joint contract with the state. Paving work on the Omaha-Fort Crook job was inevitably affected both by the

*(Continued on page 112)*

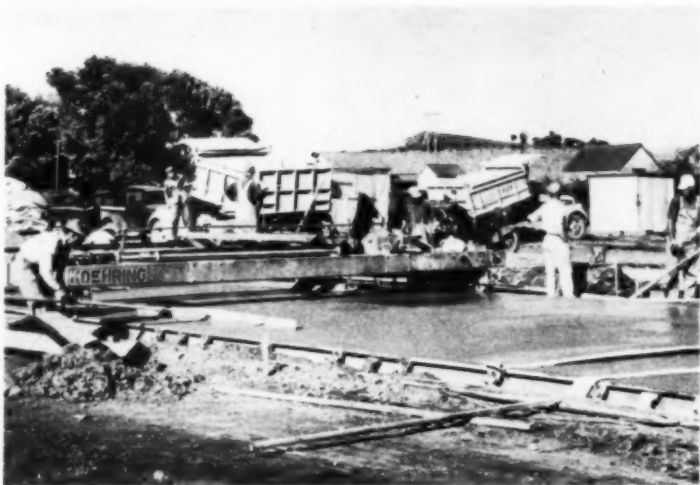


**2-YD. CLAMSHELL** on diesel crane unloads railroad cars and charges bins above aggregate batchers. Only one size of sand-gravel aggregate is used in concrete mix.



**MECHANICAL FORM TAMPER** compacts soil under base of form. Behind tamper is turntable kept fairly close to paver to reduce backing distance for batch trucks.





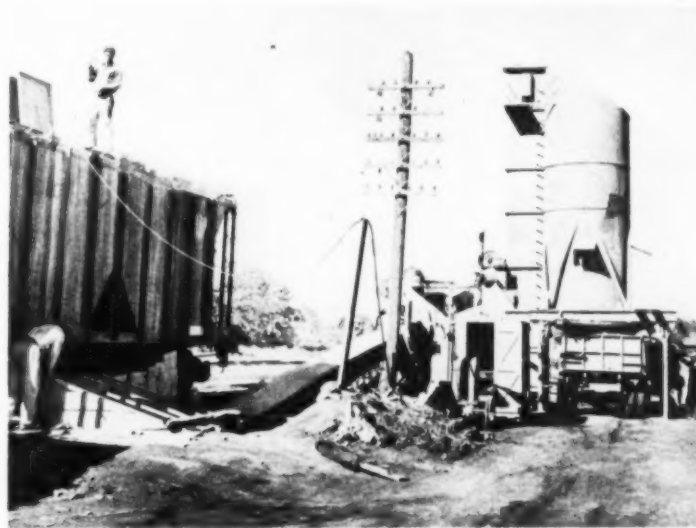
**BEHIND LONGITUDINAL FLOAT** hand finishers with straightedges and floats remove laitance and smooth pavement surface.



**AFTER HAND BELTING** of pavement surface has been completed, finisher removes metal caps to do edging job on transverse joints.



**GUIDED BY CHALK STRING**, formgrader operator cuts form trench to line and grade.



**BULK CEMENT** unloaded from hopper-bottom cars is transported by covered belt conveyor to batching plant.



**PROJECT SUPERVISION** is responsibility of LEE ODMAN (in sweater), senior engineer, Nebraska Department of Roads and Irrigation, while HARRY WOODS (left), superintendent, directs paving work for contractors.



**RAILROAD BRIDGE** to carry spur track across highway into Fort Crook has approach bents of 60-ft. creosoted piles driven by Inland Construction Co., Omaha, with Vulcan No. 2 hammer in 65-ft. swinging leads hung from boom of Koehring crane.



Four flat bearing surfaces give the Laughlin Safety Clip a four-square *Fist-Grip* on wire rope. No finger-pinching U-Bolt to bite and bend the strands, weakening them under high tension and whipping.

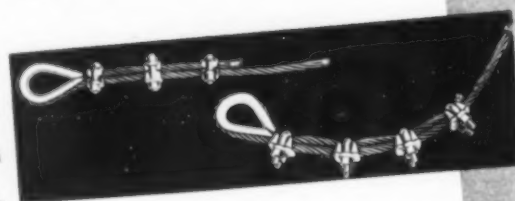
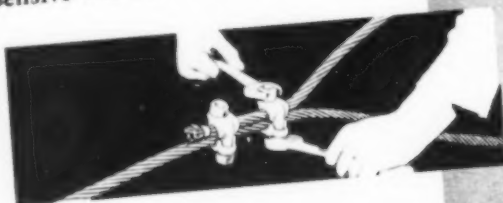
95% of Rope Strength delivered with the *Fist-Grip* Safety Clip is proved by competitive tests, three Safety Clips holding when the rope snaps under four U-Bolt Clips. Fewer clips mean savings in time and money. And experienced help can't put them on backwards — the saddles are identical.

#### 25% STEEL SAVED FOR WAR NEEDS —

For an assembly of equal strength, Safety Clips use 25% less steel than a U-Bolt assembly. You are saving precious steel available for ships, tanks and guns when you use Safety Clips. Remember — they don't crimp and crush wire rope — no expensive waste from cut-off rope ends.

#### These Safety Savings Can Be Yours

- No rope crimping — rope saved
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- Bolts on opposite sides — tightening time saved
- No battered, bent threads — clips saved
- No special wrench — tools saved
- Fewer clips needed — clips saved
- Fewer rope breaks — accidents saved



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## Selective Service Policies

DEFINED BY  
**GEN. HERSHEY.**

IN THE FOLLOWING STATEMENT, authorized for publication in *Construction Methods*, Brig. Gen. Lewis B. Hershey, director of Selective Service, clarifies policies affecting the choice of men for active military duty or for other types of service connected with the national war effort:

"Most of the actual combat fighting in this war will be done by the young men of America. Modern warfare is of such a nature that it requires the greatest in physical stamina, coordination, and reflex action. Generally speaking, the fitness of men for modern combat service is in inverse ratio to their age.

"Under recent legislation, more than 26 million men between the ages of 20 and 44, inclusive, are liable for military service. There are an additional 13 million



BRIG. GEN. LEWIS B. HERSHEY, director of Selective Service.

men 18 and 19 years of age, and 45 to 65 years of age, who are to be registered. This gives America a total manpower of some 41 millions of men who must do the tasks that are necessary in total war for total victory.

"Selective service in total war is not going to deviate from the fundamental principles which governed its operations during the peacetime training program. Men will continue to be deferred from military service when they have dependents. Men will continue to be deferred

(Continued on page 78)



# *An Engineer's* **THREE R's**



## **TECO CONNECTORS**

*spread the load on a timber joint more equally over the cross-section of the wood.*

## **Timber** **ENGINEERING COMPANY**

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**R** **READY!** There is no shortage of timber—immediate deliveries are certain.

**R** **RUSH!** Prefabrication by the TECO Connector System of timber construction speeds the job and *gets the contract.*

**R** **REDUCES COST!** The TECO Connector System cuts man-hours and material costs because fabricators deliver members ready to install—and permits lighter timber to do the work.

Get Complete Details—MAIL COUPON!

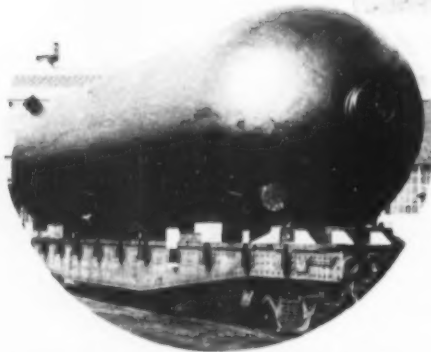
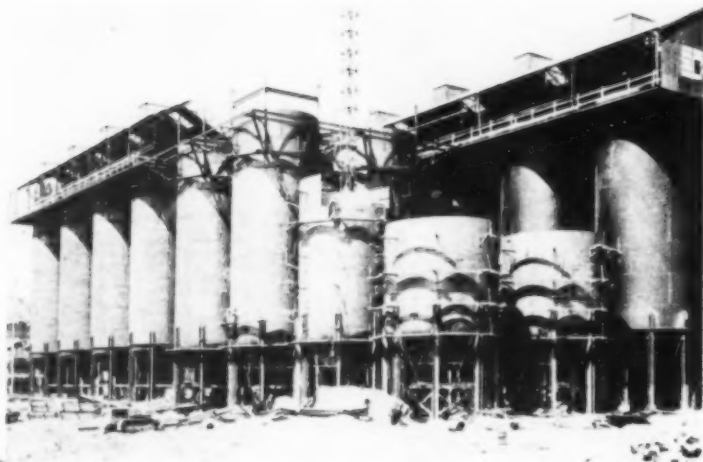
TIMBER ENGINEERING COMPANY, INC. Dept. M  
1337 Connecticut Avenue, Washington, D. C.

Please send me without cost or obligation complete information on the TECO Connector System of construction.

Individual..... Firm.....

Street..... City..... State.....

## STEEL BINS AND TANKS for essential industries



The production of essential industries must be stepped up. Welded steel bins and tanks, like the ones illustrated above and at the left, are being installed to provide greatly increased facilities for handling solids as well as liquids, and for storing finished products. By having installations of this type fabricated and erected complete by one organization, construction schedules are geared to fabrication and shipment, eliminating the loss of precious hours. Write our nearest office.

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NEW YORK · PHILADELPHIA · SAN FRANCISCO · TULSA · WASHINGTON

Plants at BIRMINGHAM, CHICAGO and GREENVILLE, PA.



**Four Sure Ways  
to  
Better Blasting**

Yes—four! *First*, use Primacord-Bickford Detonating Fuse to detonate each cartridge in its hole and to connect all holes. This insensitive high-velocity detonating fuse, with a core of PETN in a waterproof textile covering, is tough, flexible, easy to handle and amazingly effective. It saves time in loading and connecting up holes—develops more work from explosives.

*Second*, use PLAIN Primacord for practically all holes and for general use in connecting holes.

*Third*, use REINFORCED Primacord in deep holes where extra tensile strength or resistance to abrasion is desirable.

*Fourth*, use WIRE BOUND Primacord for extremely ragged deep holes or where maximum resistance to abrasion is important.

Write for a free copy of the Primacord Booklet.

**THE ENSIGN-BICKFORD CO.  
SIMSBURY, CONN.**

*Manufacturers of Safety Fuse since 1836*

**PRIMACORD-BICKFORD DETONATING FUSE**

(Continued from page 76)

from military service when they are 'necessary men,' and are difficult or impossible to replace.

"However, management and industry must recognize that the man who is deferred as a necessary man is deferred temporarily and each employer has the responsibility to secure and train replacements for such deferred men who are physically fit and would otherwise be available for military service. Occupational deferments are usually for a 6-month period. When absolutely necessary, such deferment may be continued for additional 6-month periods, but only where their continuance in the present job is absolutely necessary for the maintenance of our national health, safety, and interest.

"There is an adequate supply of replacements for necessary men among those who are physically unfit for military service, those who are presently deferred because they have dependents, those who are above the ages liable for military service—45 to 65—and in many cases among the women of this country.

"Employers must be honest and sincere in their requests for deferments and must limit such requests to cases of men who are in fact necessary. No industry or activity, no matter how closely identified with national production for war, can ever become a refuge for those who seek to avoid their obligation to their country in its hour of need."

★ ★ ★

## Light Reflecting Surfaces

ON

## OHIO HIGHWAY

(Continued from page 67)

The final 3.285-mi. link of the 11.783-mi. total was being completed in Summit County during last year's construction season. It consisted of new 22-ft. paralleling lanes with 9-ft. median strip to Route 176 from the west. From Route 176, which directly connects with Cleveland's industrial and manufacturing center into Akron, the construction of particular interest consisted of adding 13 ft. of 7-in. thick concrete base widening to each side of the old 24-ft. concrete pavement 7 in. thick, placing raised sandstone curbs on the edges and a 2-ft. concrete median strip faced with white cement mortar. Where the grade of the old pavement did not meet modern traffic demands, full-width base was constructed.

The old concrete section had irregularities, excess crown and was the scene of failures which were corrected by covering

(Continued on page 80)



# Instantaneous Dumping

IMPORTANT—Simplicity . . . no mechanical body hoisting machinery . . . dumping by gravity, instantaneously . . . saves seconds with every load . . . body is dumped by releasing body latch with lever.

## Making The Dirt Fly... Uphill

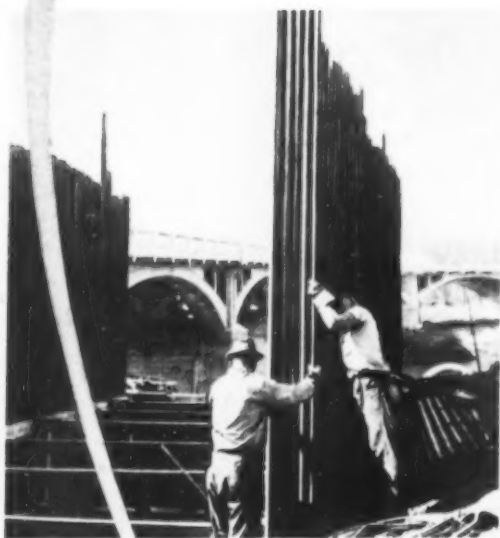
This action "shot" speaks! It tells the story, better than words, that the Koehring Dumptor dumps the load *instantaneously*, and uphill! Seconds are saved with every load! Every load is dumped *instantaneously* and completely, exactly where wanted. Being without mechanical operating parts for hoisting and dumping, the Koehring Dumptor does not consume time *preparing to dump*. The balanced body returns to loading position by force of momentum. *Instantaneous gravity dumping* cuts round trip time, increases production. Check your hauling operations and see how much time you are losing on the fill!

**KOEHRING COMPANY • Milwaukee, Wisconsin**

**HEAVY-DUTY CONSTRUCTION EQUIPMENT**



**CORRUGATED  
DOES ITS SHARE**



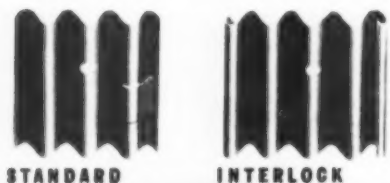
## **SAVES STEEL • SAVES TIME SAVES MONEY**

Wherever Corrugated Steel Sheet Piling is being used, conservation of vital defense effort is found. Whether on actual defense work . . . in the construction of air fields, defense plants, on rivers or harbors, or civilian projects, Corrugated does its share.

By conserving steel because of its light weight, by conserving power because of its ease of transportation and installation, by its high salvage value, Corrugated assures a definite saving in steel, power and man hours.

On your next job specify Corrugated Steel Sheet Piling. Write for catalog.

**CAINE STEEL CO.**  
1820 North Central Avenue, Chicago



**CORRUGATED  
STEEL SHEET PILING**

(Continued from page 78)

with a hot asphaltic-concrete leveling course to bring to proper section. This leveling material was laid with a spreader type machine not requiring the use of forms after the median strip was in place. Grade was controlled by the new base widening and the median strip. Correction of crown of the old pavement enabled a uniform  $\frac{3}{4}$ -in. thickness of natural asphaltic limestone cushion material to be used for the brick surfacing. The asphaltic limestone used for the cushion material occurs in a natural state and is ground to proper size, 100 percent passing  $\frac{3}{8}$ -in. openings, and has a minimum asphalt requirement of 2.7 percent. This material is easily handled and may be stocked for some time without becoming tacky as plant-mix mastic cushion material often does.

For surfacing, 3-in. vertical-fiber, lug brick with bituminous filler were used. A separating agent of whitewash solution was applied to facilitate removal of excess bituminous filler.

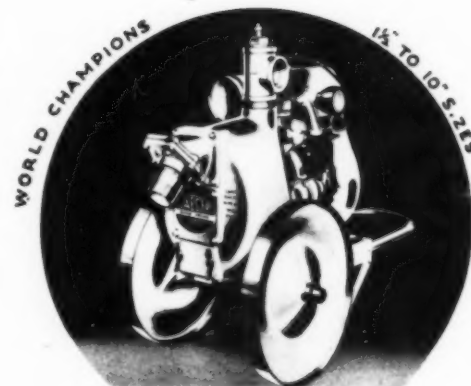
### **White Cement Median Strip**

Construction of the base of the median strip involved some interesting features. The portion which was placed over the old concrete pavement was separated from it by laying a bituminous-impregnated paper over the old pavement to prevent bond. Steel forms 7 in. high were set to grade for each side of the median strip and tied together with wire ties. Gray concrete was first placed and struck off to the proper depth with a metal strike-off operated from forms. This concrete was of the same proportions as used for regular pavement construction (6 sacks per cu.yd. minimum). A transit-mix truck was used to facilitate placing. Care was necessary to maintain the proper consistency of the gray concrete in order that a white mortar topping might be placed and not become mixed with the surfacing.

The white mortar topping, using Atlas white Portland cement and limestone sand in a 1:2 proportion, was placed on the plastic gray concrete. Another metal strike-off then was operated over the white mortar topping to strike off to proper depth, leaving sufficient material in place to form fluted reflectors. These fluted marks are not normal to the center line of the median strip, but are at an angle of 92-deg. 45 min. in order to intercept light rays from motor car headlights. The proper angle and depth of fluted marks are regulated by operating a finishing tool on guides spanning the forms. Radius effect at openings in the median strip was obtained by operating from a center point a fluted finishing tool held in proper position between forms.

Exceptionally good results were obtained on this rather new type of construction, as a result of the contractor's study and development of proper tools for doing the work. In order to test the workability of the tools proposed, the contractor built a practice section of median strip in his yard. This preliminary work not only permitted a trial of tools, which were made up specially for this job, but also enabled

(Continued on page 84)



## **Only JAEGER Pumps Have All These Features**

- **JAEGER PRIMING JET** — Up to 5 times faster prime and re-prime — no adjustments, no need to "gun" engine.
- **POSITIVE RECIRCULATION CUT-OFF** — controlled by flow, not pressure.
- **LONG LIFE SEAL** — accessible for inspection.
- **PATENTED SELF-CLEANING SHELL.**
- **EVERY PUMP FACTORY-TESTED** for high capacity and pressure.
- **COMPLETE RANGE OF SIZES, TYPES** — to over 200,000 g.p.h.

Send Today for Latest Catalog and Prices.

**THE JAEGER MACHINE CO.**  
800 Dublin Ave., Columbus, Ohio

## **ARMSTRONG Reversible Construction RATCHET WRENCHES**



Among big ratchet wrenches for bridge, structural and erecting work the ARMSTRONG Ratchet stands alone with its drop forged, heat treated steel handle, its instantly reversible ratchet and hollow center sockets, that are machined from solid steel. Here are the strongest, longest wearing ratchets made — there is not a casting used, and all moving parts are hardened. They are cadmium plated.

Open spindle and socket permit long bolts to pass thru wrench so nuts can be run any distance on thread, and can be quickly and securely set.

24" Ratchet takes 1" to 2 3/16" Sockets (13 sizes)

36" Ratchet takes 1 1/2" to 3 1/4" Sockets (11 sizes)

Write for Catalog

**ARMSTRONG BROS. TOOL CO.**  
"The Tool Holder People"  
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Eastern Warehouse and Sales Office:  
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... say leading contractors



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no mechanical troubles on  
this job, thanks to better  
protection with Gulf Lubricants"

... Says the contractor on this  
mountain highway project

"With repair parts increasingly  
hard to get, we can't take  
chances with our lubrication"

HERE'S one important reason why so many leading contractors standardize on Gulf oils and greases: With higher lubricating value and greater stability these quality lubricants provide better protection for their equipment. Thus they are insured to the greatest possible extent against delays caused by breakdowns and mechanical troubles. The extra hours of trouble-free service they gain enable them to do a speedier, more profitable job.

Good lubrication—always a necessity for the

satisfactory operation of contractors' equipment—today is a vital requirement for the successful completion of tough jobs on schedule. For delivery dates on repair parts and new equipment are increasingly more uncertain. Breakdowns of key equipment can well be a serious matter.

So play safe on your next job—ask a Gulf engineer to recommend the right lubricants for each piece of equipment you are using. His recommendations are based on broad experience and knowledge gained through daily contacts with contractors' problems in the field. His one big aim is to help speed your job.



Gulf quality lubricants and fuels are quickly available to you through more than 1200 warehouses in 30 states from Maine to New Mexico. Write or 'phone your nearest Gulf office today.

GULF OIL CORPORATION · GULF REFINING COMPANY · PITTSBURGH, PA.



**Thor**

**ROCK DRILLS—PAVING BREAKERS  
CLAY DIGGERS—SUMP PUMPS &  
ASSOCIATED AIR TOOLS**

**Step Up Work Output and Save Money, too  
on the Big Job Ahead**

There's another big job ahead for construction in 1942! More new military structures . . . more new industrial plant expansion . . . more new defense housing . . . more new repair and maintenance work of all kinds. In going after the extra output that's needed . . . in cutting down time wherever you can, don't forget the major part that powerful, sturdy, efficient THOR Air Tools can play on every job. With their unmatched performance advantages they speed the work and keep costs down.

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THOR Catalog No. 42 contains complete descriptions, specifications, illustrations, and construction data on the complete line of THOR Air Tools for every construction and mining job. Send for your copy.



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**Portable Pneumatic and Electric Tools**

**INDEPENDENT PNEUMATIC TOOL COMPANY**

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Branches in Principal Cities



## "The Air Tools With the Extras"

**Give You Performance Advantages  
Unmatched By Any Other Tools**

The power that boosts output, the handling ease that cuts fatigue, the operating efficiency that spells profits — all these you get in "extra" measure with THOR air tools. Responsible for these "extras" is the great lineup of THOR construction features that includes:

- The exclusive THOR "Short Travel Tubular Valve" that utilizes effectively all the air that enters the machine.
- The exclusive THOR "Swing Feed" Cylinder on Stoper drills that makes it easy to change water tubes on the job.
- The THOR "Power Feed" that speeds the entire drilling cycle on drifting operations.
- The THOR Latch Type Retainer that speeds up steel changes on paving breakers.
- The THOR "Pigtail Rubber Bumper" that makes clay diggers smoother handling.



**Paving Breakers**

Three Thor models in 32, 59, and 84 pound sizes for light and heavy duty. Rugged alloy-steel, drop-forged construction. Rubber grip handles. Short travel tubular valve. Latch type retainers.



**Rock Drills**

There are thirteen different models of Thor Sinkers, Stopers and Drifters. Light, medium and heavy duty types. Wet and dry operation.

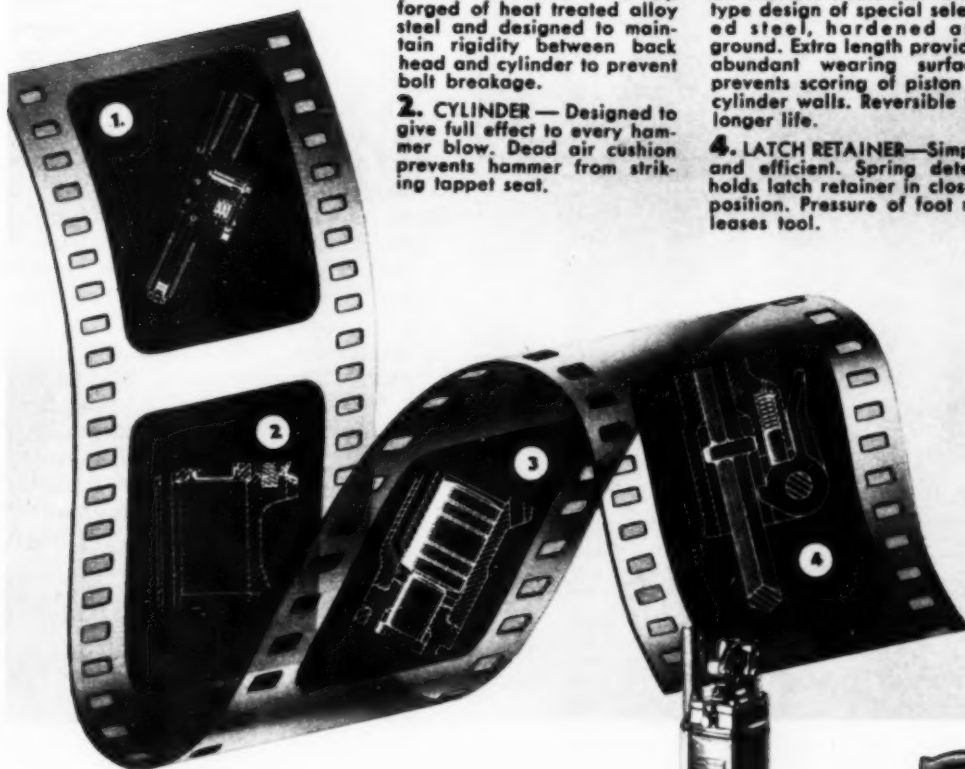
### Paving Breaker Details That Typify Advanced Design of All Thor Air Tools

**1. BACK HEAD** — Drop forged of heat treated alloy steel and designed to maintain rigidity between back head and cylinder to prevent bolt breakage.

**2. CYLINDER** — Designed to give full effect to every hammer blow. Dead air cushion prevents hammer from striking tappet seat.

**3. PISTON HAMMER** — Block type design of special selected steel, hardened and ground. Extra length provides abundant wearing surface, prevents scoring of piston or cylinder walls. Reversible for longer life.

**4. LATCH RETAINER** — Simple and efficient. Spring detent holds latch retainer in closed position. Pressure of foot releases tool.



### A Tool for Every Job

*Sinker Rock Drills . . . Stoper Rock Drills . . . Drifter Rock Drills . . . Paving Breakers . . . Clay Diggers . . . Trench Diggers . . . Backfill Tampers . . . Surfacing Grinders . . . Air and Electric Saws . . . Electric Hammers . . . and Accessories.*



**Sump Pumps**

Self-priming, centrifugal impeller type pumps that operate efficiently under the most unfavorable conditions. Variable speed throttle. Automatic lubrication.



### Clay and Trench Diggers

A complete range of six models. The new Thor Pigtail Rubber Bumper and Thor Cylindrical Rocker Valve are two of many features that speed up work.



# KEEP 'EM SMOKING

*and we'll  
"keep 'em flying"*

**A**MERICA'S greatest armament is her industrial capacity . . . her ability to outproduce any nation on the face of this earth. The "guns" of American industry point their muzzles skyward, but their range is incalculable. In this war of materiel it is vital that we keep them smoking.

Good tools are essential to efficient industry. Our job, along with that of thousands of others, is to keep them good and to keep them coming. In that duty, we shall not fail.



J. H. WILLIAMS & CO.  
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## WILLIAMS

SUPERIOR DROP-FORGED TOOLS

Headquarters  
for over half a century for  
DROP-FORGINGS and DROP-FORGED TOOLS



(Continued from page 80)

the finishers to produce the result desired and discuss various details of improving workmanship when actual work started. This practice construction on the part of contractor is to be commended and should be encouraged, especially where new construction features are involved.

### Blackened Center Strip

Another type of median strip, varying from 4 ft. to 8 ft. in width, was used for a portion of the project where both east and westbound lanes were reconstructed. It had recessed white-mortar-faced panels to provide reflecting bands on the inclined face on each side. A blackened center strip also provided some interesting construction procedure. The contractor elected to set 12-in. forms and place the 12 to 24-in. gray concrete, with white mortar facing for the recessed panels following in a separate operation. Transit-mix gray concrete was placed and struck off with a finishing tool operated from the form and adjacent concrete. Face forms for inclined surface then were placed. These forms were of the suspension type and could readily be set into place. The five recessed panels which occurred at 20-ft. 2-in. intervals were formed on a separate metal strip inserted at measured intervals and carried from the suspension forms. Atlas white cement mortar then was placed and allowed to attain partial set before removal of face forms and floating and touching up operations were completed.

The center portion of the median strip was completed the following day. Gray concrete was struck off  $\frac{3}{8}$  in. below previously placed inclined face sections and 1 in. of white cement mortar topping was then placed, finishing  $\frac{1}{8}$  in. above the adjacent white band. Iron oxide was floated into the top  $\frac{1}{4}$  in. of the center, after the mortar had attained partial set, to provide a contrasting effect.

Active and continued interest throughout the construction of the project by both contractor's forces and engineers in charge of construction in the features which were comparatively new resulted in methods of workmanship which have been adopted on other projects having similar construction problems. Proper preliminary study and provision of tools necessary to do the job resulted in good workmanship with a minimum of effort.

### Personnel

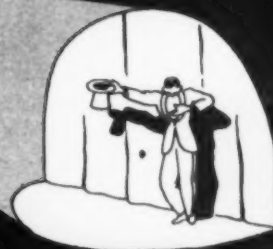
A. J. Baltes Co., of Norwalk, Ohio, was contractor for the three contracts totaling 11.783 miles. Robert Craig was superintendent in charge of construction for the contractor. L. W. Hine was project engineer for the Ohio State Highway Department on all the projects involved. Homer Anderson, division engineer at Ravenna, for Division 4 and William W. Wardman, assistant division engineer in charge of construction, supervised the work in Summit County, while Vance T. Grimes, division engineer at Ashland, and his assistant division engineer, Frank Murray, supervised the work in Medina County. T. W. Kinnear was chief engineer of construction and Hal G. Sours, director of highways during construction of project.



# ANNOUNCING . . .

*the Bucyrus-Erie*

## **Transit Crane**



**performance on wheels!**

Designed exclusively for crane-excavator service from cab to tail light, from boom point to outriggers the new Transit Crane combines speed and dependability to meet the requirements of rush wartime jobs.

Hoist and swing speeds are synchronized to give a high-speed cycle. A fully independent boom hoist, giving power control of raising and lowering, permits extreme accuracy in load handling. Extra boom sections can easily be added or removed to fit boom length to the individual job. Open-throated boom permits easy rigging for multi-part lines. Field conversion from crane to clamshell, dragline, shovel or dragshovel is easy. The wheel mounting provides an all-welded base with maximum strength per pound of weight. Tandem rear axles mounted on an equalizer beam assure full traction over rough ground. Dual worm drive provides smooth application of power. Ten speeds forward and two reverse give a choice of speed-power combinations to fit a wide range of travel conditions.

There are a host of features that contribute to the outstanding performance of this fast-working, fast-moving crane. If you have work for a unit of this type, write for full details on the new Transit Crane.

**2 MODELS  
AVAILABLE**

**22-B**

Maximum crane rating, 40,000 pounds; travel speeds from 2 to 31 m. p. h.;  $\frac{3}{4}$  yard clamshell, dragline, shovel and dragshovel.

**15-B**

Maximum crane rating, 20,000 pounds; travel speeds from 2.3 to 27.5 m. p. h.;  $\frac{1}{2}$  yard clamshell, dragline, shovel and dragshovel.

# Bucyrus-Erie

S O U T H M I L W A U K E E , W I S C O N S I N

## A saving hint ON BRIDGE MAINTENANCE



To prevent scouring and undermining ARMCO sheeting was driven into the streambed 30 inches from the abutment face. J-bolts anchored the sheeting and a firm footing was provided by cleaning and filling the open space with concrete.

- When scouring or undermining weakens bridge abutments here is a helpful hint: Use ARMCO Sheeting to assure a firm footing, reduce maintenance and protect the bridge structure.

Then you will have the same advantages that make ARMCO Sheeting ideal for trench work, cofferdams, cut-off walls, foundations and bulkheads. The corrugated metal design provides ample strength without excessive weight, which means quick, easy handling. It drives fast because of the small displacement area and smooth surfaces. On temporary jobs you can pull ARMCO Sheeting again and again for thrifty re-use. Individual units nest snugly together for space-saving in storage or transit.

An ARMCO Sheeting is supplied for every purpose—Flange Type, Clip-Type and Interlocking. Write for complete information and prices. ARMCO DRAINAGE PRODUCTS ASSN., 115 Curtis St., Middletown, O.



### ARMCO SHEETING

## Four Types of Bituminous Pavement

### At Fort Leonard Wood

(Continued from page 48)

dening and relocation increasing the total to about 213,000 sq.yd., at 64c. per sq.yd.

(3) Koss Construction Co., Des Moines, Iowa, contractor for two types of construction: (1) 27.3 mi. of double inverted penetration 22 ft. wide on primed 3-in. stone base previously constructed, about 376,000 sq.yd., at 29.7c. per sq.yd., and (2) 7.3 mi. of prime with seal and armor 22 ft. wide on 3-in. stone base already in place, about 107,000 sq.yd., at 14.3c. per sq.yd.

In addition to the three contracts awarded on July 31, an award had been made on the preceding day to Tobin Quarries, Inc., Kansas City, Mo., covering the paving of 212,000 sq.yd. of motor parks for army equipment. This work called for placement of a 3-in. crushed stone base, followed by application of prime and a 1½-in. asphaltic concrete surface at a bid price of \$1.18 per sq.yd.

Completion by Nov. 1 was specified by three of the contracts, and the fourth, for asphaltic concrete surfacing on roads, set Dec. 1 as the completion date. All the jobs were under a \$50 a day penalty, with extensions permitted for extreme bad weather and acts of God. Missouri experienced unfavorable weather in abundance during the fall. In October the precipitation of the state was 353 percent of normal, and the average for the three months, September to November, inclusive, was 190 percent of normal. The unusual rainfall caused some delays in the work and earned reasonable time extensions for the contractors. All of the contracts were completed within the extended time limits.

#### Asphaltic Concrete Paving

Among the equipment units assembled by the two contractors on asphaltic concrete paving, separate mixing plants of contrasting types were objects of special interest. The two plants were set up along a railroad siding in close proximity to each other. For the two asphaltic concrete mixtures laid in 2½-in. binder course and ½-in. surface course on roads, the Granite Bituminous Paving Co. operated a conventional Warren Bros. plant equipped with a 2,000-lb. pugmill mixer which produced about 60 tons of hot material an hour. On the paving of motor parks, Tobin Quarries, Inc., produced an equal output of hot-mixed material for 1½-in. asphaltic concrete surface with a fully portable Bar-

(Continued on page 88)

## Byers PERFORMANCE sets records that are HARD TO BEAT



• A Byers ¾ yd. in Washington State ripped up solid 8 inch concrete pavement. A ¾ yd. Bearcat Jr. in Camden, N. J. dug 50 yds. of moulding sand per hour. A ½ yd. Model 60 at Mammoth Cave, Ky. loaded 1000 yds. of dirt in 8 hours into trucks. A Model 65 dragline in Florida averaged 1200 yds. in 10 hours on a drainage job using ½ yd. bucket.

These typical performance reports constitute another reason why you should investigate Byers.

### 11 FULLY CONVERTIBLE MODELS IN 3/8-1/2-5/8-3/4 YD. SIZES

Modern CRANES and SHOVELS

# BYERS

WARREN, OHIO

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## "FLEX-PLANE"

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### FINISHING MACHINES

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and

### JOINT INSTALLING MACHINES

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### FLEXIBLE ROAD JOINT MACHINE CO.

★ ★ ★ ★ ★

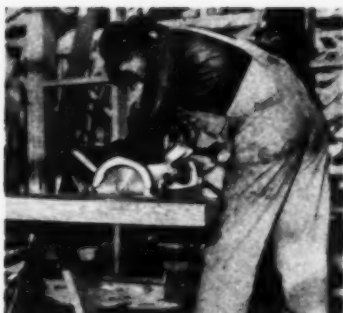
WARREN, OHIO

★ ★ ★ ★ ★





PRE-CUTTING STAIR STRINGERS at an Army camp with famous Black & Decker No. 85 QUICK-SAW. One of four powerful, lightning-fast models, with depths of cut from 1 1/8" to 3 1/8".



HEAVY CONSTRUCTION TIMBERS being quickly cut with Black & Decker husky No. 95 Electric Saw. This model has ample power and extra depth of cut to zip through toughest lumber in seconds.



SAWING 90 RAFTERS IN 45 MINUTES with Black & Decker Electric Saws on a large construction project. An example of how these fast saws step up cutting on any type operation.



SAWING FORM PANELS for concrete foundations with Black & Decker Electric Saws. They also clip time from sawing scaffolding, falsework and other similar construction jobs.

## SPEED CONSTRUCTION SCHEDULES ★ FOR UNCLE SAM ★



TO SPEED SCHEDULES in building Ft. Lewis, Wash., Black & Decker Heavy Duty Electric Drills were used by Timber Structures, Inc., Portland contractors, for fabricating heavy timber roof trusses.



CUTTING OPENING IN CONCRETE with husky Black & Decker Electric Hammer and web tool. They also vibrate concrete and drill rock for "pot shots." Four models—1/2" to full 2" capacity.



DEMOLISHING WALLS with powerful Black & Decker Hammer and bull point. This and other brute work requiring hard-hitting hammering action is done quickly and easily with B & D Electric Hammers.

### with BLACK & DECKER Portable Electric Tools!

BLACK & DECKER Electric Tools help contractors break records on every type of war construction—industrial expansion, military and naval projects. Black & Decker Electric Saws zip through lumber ten times faster than by hand. They make rip, cross and angle cuts. They're kept safe by instant-acting, ball-bearing telescoping blade guards.

Smashing thousands of sledge-hammer blows a minute, Black & Decker Electric Hammers knock hours from jobs requiring brute pounding action. They drill in concrete and stone—shape or gouge timbers.

Husky Black & Decker Electric Drills quickly bore wooden timbers and metal fastenings, to speed up heavy frame construction. Black & Decker Electric Tools plug in any light socket or portable generator. They're powered to take the tough spots without overheating or slowing down—are engineered to deliver long, efficient service. Phone your jobber to demonstrate the Black & Decker Electric Tool you need—or write for information today.

### FREE Handbooks Show Contractors HOW TO FINISH JOBS FASTER!



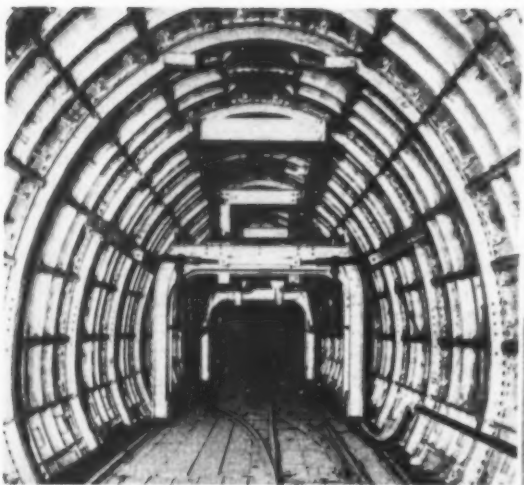
Send for the building Handbooks you need, showing dozens of construction applications of Black & Decker Portable Electric Tools. Pin coupon to your letterhead and mail to The Black & Decker Mfg. Co., 759 Penna. Ave., Towson, Maryland.

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## BLAW-KNOX STEEL FORMS

## For Economic PERMANENCE



### HIGHWAY STRUCTURES OF DOUGLAS FIR

*Designs and Illustrations of* GUARD RAILS-CULVERTS-TRESTLES-TRUSS BRIDGES  
ARCH BRIDGES-SUSPENSION BRIDGES - as built in Douglas Fir

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Today's heavy travel demands good highways. Wood is available—bridges and other highway structures, strong and durable for anticipated years of service, may be built NOW—with speed and economy.



**WEST COAST LUMBERMEN'S ASSOCIATION**  
364 Stuart Bldg., Seattle, Washington



*This booklet on request—no charge*

(Continued from page 86)

ber-Greene continuous mixing plant served by a volumetric proportioning unit which assured uniform gradation of aggregate. Large units of this plant, including the mixer, the volumetric proportioning unit and a single-drum dryer, were mounted on pneumatic tires for ready mobility. Output of the plant could have been increased considerably above the 60-ton-per-hour rate with twin dryers.

To lay the paving courses in required thicknesses of 2½ in. and ½ in. on roads and of 1½ in. on motor parks, both contractors used Barber-Greene tamping-leveling finishers. These machines traveled on the pavement to spread, strike off and compact hot-laid asphaltic concrete in 11-ft. lanes on the streets and roads 22 ft. and 33 ft. wide and in 10-ft. lanes on the motor parks. Trucks dumping their hot loads into the hoppers on the front ends of the machines were pushed ahead by the finishers during the unloading operation.

For compaction of asphaltic concrete in two-course construction on roads the Granite Bituminous Paving Co. operated a pair of Buffalo-Springfield rollers, a 10-ton three-wheel unit ordinarily being employed on binder course and an 8-ton tandem machine on the ½-in. top course. In paving the motor parks, Tobin Quarries, Inc. did the fine grading with a Caterpillar No. 11 diesel patrol grader and spread the crushed rock for the 3-in. base with an Adnun spreading-finishing machine. Base rock and chokestone were rolled with two three-wheel flat steel rollers, an Austin 10-ton and a Kelly-Springfield 8-ton. The 1½-in. hot-laid asphaltic concrete surface was compacted and ironed with an Austin 8-ton tandem machine.

#### Paving of Motor Parks

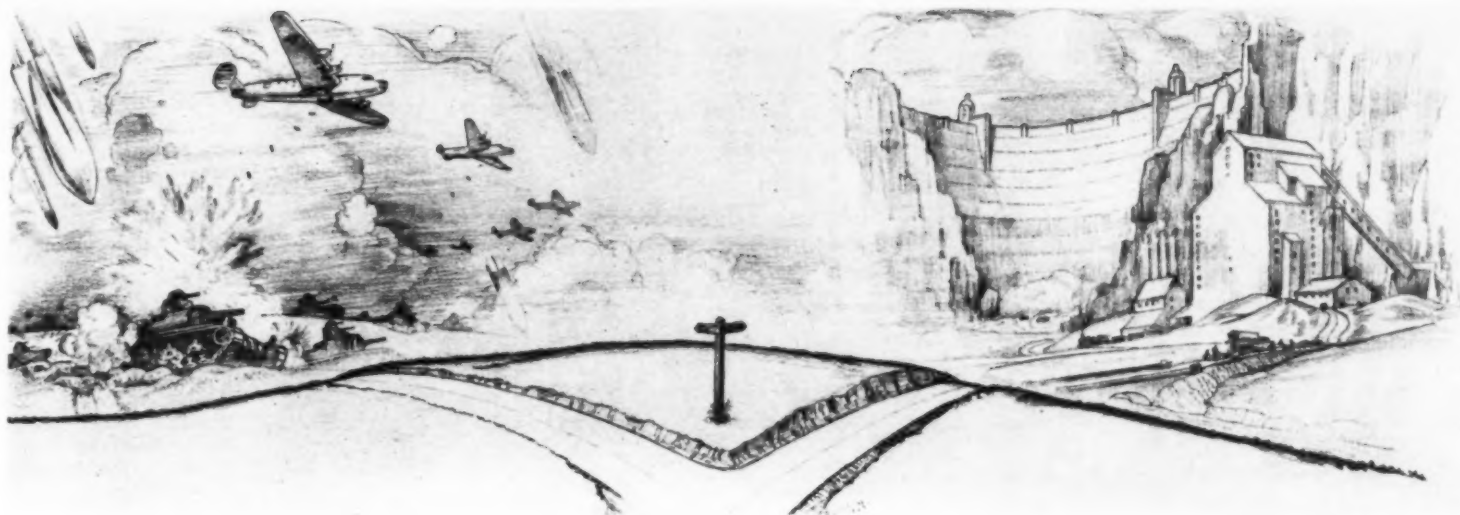
After the subgrade had been bladed and rolled to uniform smoothness and density, the Adnun spreader distributed crusher-run rock of required hardness graded from 2½ in. to material passing the No. 200 sieve. The base then was rolled, and choke stone was added and worked into the voids by brooming and rolling. When properly keyed and compacted to form a stable 3-in. base, the top surface of the stone mat was primed with a medium-curing asphaltic oil at a rate of about 0.4 gal. per sq.yd.

For the hot-mixed, hot-laid asphaltic concrete surface course, the specifications called for a mixture containing 6 to 9 percent asphalt of 50-60 penetration combined with coarse aggregate, fine aggregate and mineral filler in a mixture which included 2 to 12 percent of stone passing the 1-in. screen and retained on the ¾-in. screen and 6 to 15 percent of fine material passing the No. 200 sieve. To provide an adequate proportion of fines, the mineral filler for the mixture had to meet a gradation requirement specifying 75 to 100 percent passing the No. 200 sieve and not less than 30 percent passing the No. 325 sieve.

Asphaltic cement was stored in a tank

(Continued on page 90)





## We Shall Try to Keep the Record Straight

**D**O NOT picture the explosives manufacturer as one who simply presses a button and, presto! peacetime commercial explosives production is transformed into powder for shells and bombs.

To begin with, commercial explosives manufacturing facilities are not suitable for munitions production. Dynamite is not used in bombs and shells. TNT is not made in a dynamite plant. Complete new plants must be erected on a gigantic scale.

Peacetime explosives are essentials of constructive effort, so much so that Government recognizes their necessity in construction projects, in mining, in quarrying and other primary enterprises. Continued production of commercial explosives is important in maintaining the economy.

In the second place, the making of explosives is only one of the uses to which chemicals are put by an industry such as "Atlas Powder." Other Atlas chemical products—finishes, coated fabrics, activated carbons, synthetic chemicals, processing aids—are fundamental products indispensable to many phases of industry.

War demands come first—and Atlas has enlisted for the duration.

What Atlas has to offer is "knowledge" in the art and science of explosives making—experience, technique, laboratory foresight—the capacity to organize and train for large-scale production. Atlas is now operating for the Government, Government-owned plants such as those at Ravenna, Ohio, and Weldon Spring, Mo. In these plants, we are contributing our competency and service on a fixed fee basis.

But with all our involvement in the war effort, we are doing our level best and meeting the demands of commercial production. As in any other industry, problems are tough and plentiful. Ingenuity, elbow grease and patience are great aids when producer and customer cooperate—it is amazing how much can be accomplished—and we shall try to keep the record straight.

**ATLAS** EXPLOSIVES  
"Everything for Blasting"



ATLAS POWDER COMPANY, Wilmington, Del. • Offices in principal cities • Cable Address—Atpowco

# POWER

**IS THE STUFF  
GOOD TRUCKS ARE MADE OF**



There is no substitute for power in construction work. The truck that can climb the ramp in the highest gear helps win the battle with time. The truck that can deliver its load quickest helps get the job done sooner. The truck that can handle peak loads without excessive wear and strain gives you more hours of work for less hours of maintenance. Watch the GMCs on any big job and you, too, will agree—*power is the stuff good trucks are made of!* General Motors Trucks are the strongest pullers in every engine size.

Our own YMAC Time Payment Plan assures you of lowest available rates



General Motors Truck and Coach is co-operating with Government policy in the manufacture and distribution of all GMC trucks.

Truck operators can co-operate in the nation's transportation program by careful driving and proper maintenance of their trucks. This will lengthen the life of both tires and trucks.

**THE TRUCK  
OF VALUE**

# GMC

**GASOLINE  
- DIESEL**

*(Continued from page 88)*

equipped with steam coils which maintained the material at a temperature between 275 and 350 deg. F. For the aggregate as it came from the dryer the specifications provided a temperature range of 250 to 375 deg. F. but required that the actual temperature be kept within 20 deg. F. above or below that desired by the constructing quartermaster. To assure accurate heat control it was stipulated that the plant be equipped either with a pyrometer having two terminals or with two single-terminal pyrometers, one terminal to be in the asphalt tank and the other in the chute leading from the dryer. The asphaltic concrete mixture was required to have a temperature of 250-350 deg. F. when discharged from the mixer and a temperature of 250-325 deg. F. when spread on the primed stone base.

Specifications for asphaltic concrete mixtures laid in binder course and wearing course of pavement for roads and streets likewise required a 50-60 penetration asphalt and in general stipulated temperature ranges corresponding to those for paving of motor parks. The mixture for the 2½-in. base course called for 3 to 5 percent of bitumen and 14 to 22 percent of stone passing a 1½ in. screen and retained on a 1-in. screen. No mineral filler was used in this mixture, which required 2 to 5 percent of fine material passing a No. 80 sieve and retained on a No. 200 sieve. For the ½-in. wearing course, the specifications stipulated a bitumen content of 6 to 9 percent and a maximum size of aggregate, passing a ½-in. screen and retained on a ¼-in. screen, in proportions of 12 to 17 percent. Mineral filler used in the wearing course mixture met the same specifications as governed this ingredient for asphaltic concrete on motor parks. The mixing cycle comprised 30 sec. of dry mixing and 45 sec. of wet mixing.

## Base Prime

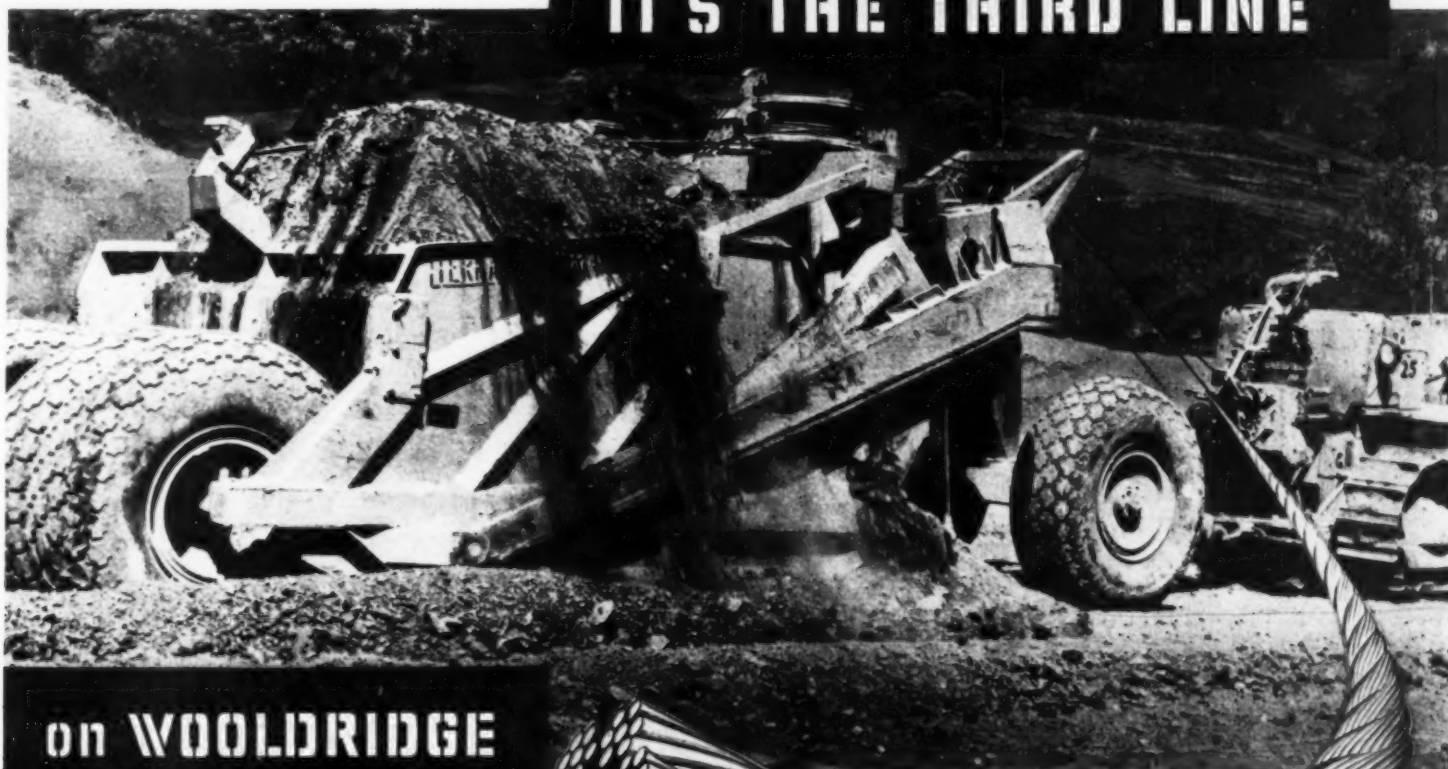
On all the bituminous paving contracts crushed stone base was primed by the Missouri Petroleum Co., St. Louis, using four Etnyre distributors supplied with two grades of medium-curing cut-back asphalt from tank cars heated by Cleaver-Brooks heaters. In warm weather, MC-1 of 40-80 viscosity was applied to the base; as the weather grew cooler, the type of liquid asphalt was changed to MC-0 of 15-30 viscosity. With the single exception of the Koss Construction Co., all the contractors purchased both prime oil and heavier asphalt from the Union Asphalt & Road Oils Co., Kansas City, Mo. The Koss Construction Co. bought its prime oil from the Carter-Waters Co., Kansas City.

Aggregate for the 2-in. bituminous mat constructed by the O'Dell & Riney Construction Co. was produced by the contractor with a Cedar Rapids one-piece portable crushing and screening plant which took its raw material out of the Roubidoux River near Waynesville, several miles

*(Continued on page 93)*



# IT'S THE THIRD LINE



## on WOOLDRIDGE 3 *line* SCRAPERS



Just as three men will accomplish more work than two, 3 cables will, by lasting longer, move more yardage than two.

For on the slender thread of cable-life depends the number of loads a scraper will haul in a given length of time. On Wooldridge 3 line scrapers it's the third line that increases the service life of each cable by evenly dividing cable loads between all three lines, rather than concentrating on two. Cable wear and down-time for repair is thereby reduced by more than a third. This means that you can expect at least 30% more work from a Wooldridge 3 line scraper. It's also the third line that gives the operator individual three way control of the hoist, the front apron and the load ejector which results in faster digging, faster loading, faster hauling, and faster dumping of larger heaping loads. By keeping down-time and cable costs down, you can make pay dirt pay more with a Wooldridge. Write today for complete facts.

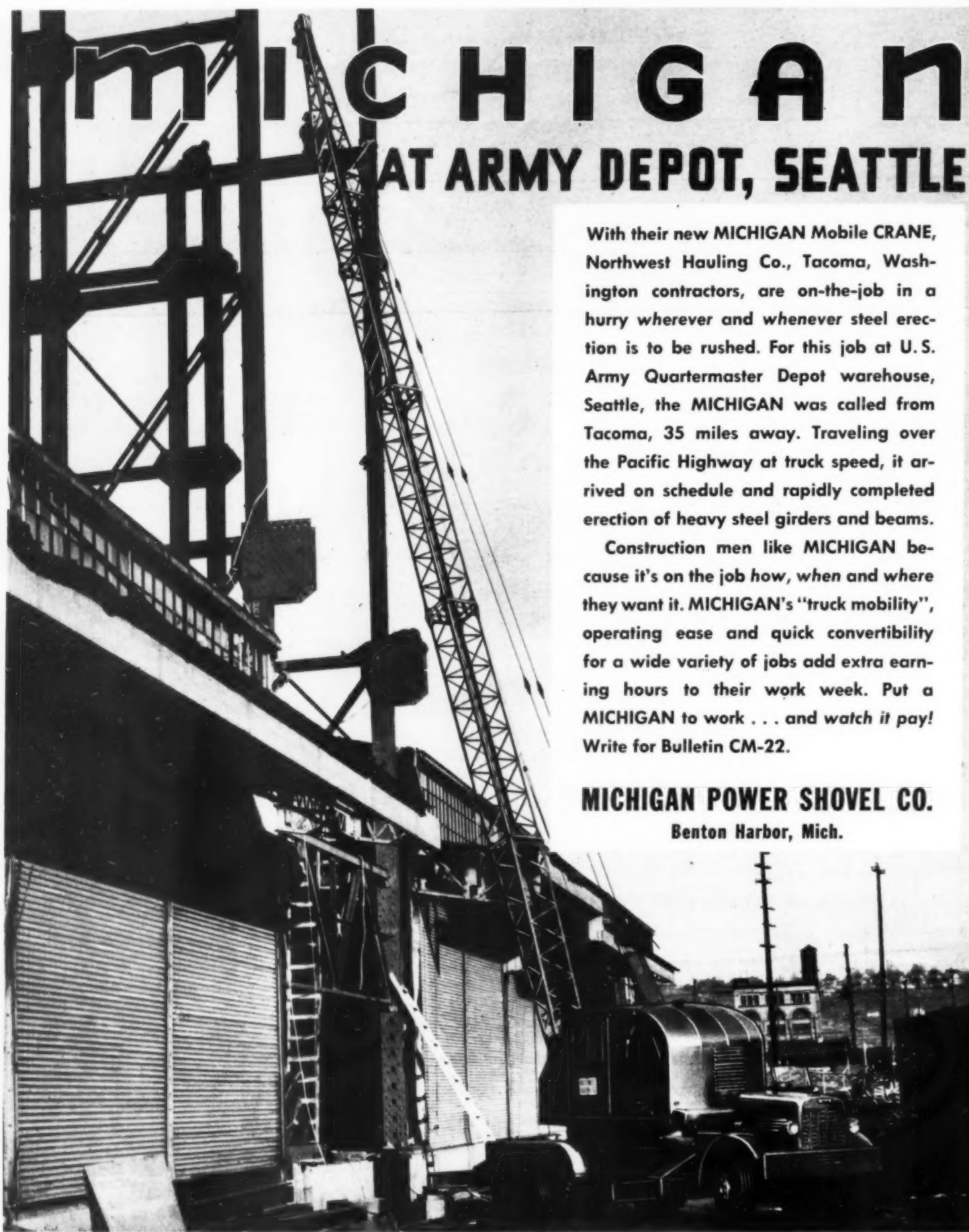
- ★ Divides cable load 3 ways
- ★ Eliminates premature cable failure
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- ★ Lowers cable costs
- ★ Provides faster, surer control
- ★ Increases the number of loads
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With their new MICHIGAN Mobile CRANE, Northwest Hauling Co., Tacoma, Washington contractors, are on-the-job in a hurry wherever and whenever steel erection is to be rushed. For this job at U. S. Army Quartermaster Depot warehouse, Seattle, the MICHIGAN was called from Tacoma, 35 miles away. Traveling over the Pacific Highway at truck speed, it arrived on schedule and rapidly completed erection of heavy steel girders and beams.

Construction men like MICHIGAN because it's on the job how, when and where they want it. MICHIGAN's "truck mobility", operating ease and quick convertibility for a wide variety of jobs add extra earning hours to their work week. Put a MICHIGAN to work . . . and watch it pay! Write for Bulletin CM-22.

### MICHIGAN POWER SHOVEL CO.

Benton Harbor, Mich.

# MICHIGAN

AIR-CONTROLLED

SHOVELS - CRANES - CLAMS
DRAGLINES - TRENCH HOES



(Continued from page 90)

north of the fort. The plant turned out about 700 tons per day.

Bituminous mat for the 7.8 mi. of roads was constructed by mixed-in-place methods with Caterpillar No. 12 patrol graders which worked half the width at a time, leaving the other half open for traffic. After the base had been primed, mineral aggregate meeting the specified requirements was spread to the proper depth on half the roadway for application of the bituminous material. The aggregate was graded from 1-in. size down to a minimum fineness of 5 to 10 percent passing the No. 200 sieve. Specifications called for additions to the mineral aggregate of between 3½ and 7 percent by weight of bituminous material applied in the form of a medium-curing liquid asphalt, the exact percentage used being determined by laboratory tests and field sieve analyses of the aggregate.

After the mineral aggregate, applied at a rate of 184 lb. per sq. yd., had been thoroughly coated with the liquid asphalt by mixing on the road with the motor patrol graders, the mixture was distributed evenly by the blades across the half width of roadway and was compacted with Buffalo-Springfield rollers. The bituminous mat was allowed to cure for not less than six days under traffic prior to the application of an asphalt seal.

For the seal coat, hot asphalt of 200-250 penetration was applied by a pressure distributor at a rate of 0.25 gal. per sq. yd. Immediately behind the asphalt application, Buckeye roll spreaders attached to the rear of trucks distributed cover stone of less than ½-in. maximum size at a rate of 20 lb. per sq. yd. As soon as the asphalt became sufficiently tacky to hold the cover material in place, a rotary sweeper or drag broom distributed the cover stone uniformly over the surface. After the brooming, the surface was rolled with a flat steel roller producing a pressure of not less than 120 lb. per lin. in. of wheel width.

#### Inverted Penetration

Raw material excavated from the Roubidoux River also was used by the Koss Construction Co. to supply a smaller Cedar Rapids one-piece portable crushing and screening plant producing aggregate graded from ½ in. down for the 27.3 mi. of double inverted penetration type bituminous surface built by this contractor. Plant output averaged about 600 tons per day. For construction of the inverted penetration pavement, the contractor employed Buckeye and Galion roller-type spreaders, power brooms and rollers.

On dry, clean crushed stone base previously constructed, a pressure distributor applied a prime of 0.35 to 0.45 gal. of MC-1 or MC-0 cut-back asphalt. The primed surface was closed to traffic for at least 24 hr. or as much longer as required for thorough penetration.

Mechanical spreaders attached to the rear of trucks then spread crushed stone uniformly over the surface at a rate of 25 lb. per sq. yd. Following this first application of stone, a pressure distributor

put down 0.55 to 0.65 gal. per sq. yd. of cut-back asphalt of grade MC-4 or MC-5. Immediately after the first application of MC cut-back asphalt, the stone spreaders made a second application of crushed aggregate, spreading the material uniformly over the surface at a rate of 40 lb. per sq. yd. Supplementary hand methods were employed where necessary to assure complete, uniform coverage with the stone. As a final operation, rotary sweepers went over the surface to keep the material uniformly distributed until firmly bonded by rolling and by the action of traffic during the curing period.

After the bituminous mat had cured under traffic and become sufficiently firm, the surface was swept clean and sealed by an application of hot asphalt followed by a 20-lb. armor coat as previously described for bituminous mat paving.

#### Supervision

With the award of contracts enumerated in these notes, all of the roads in Fort Leonard Wood entered their final stages of construction involving hard surfacing, surface treatment or oiling. In addition to the work performed by contract, a large mileage of access roads was built by CCC, WPA, and CQM forces. All of the construction by these forces and by contractors was under the direction of Capt. William C. Campbell, constructing quartermaster at Fort Leonard Wood, with Jack P. Edwards, CQM engineer, in immediate charge.

For the paving contractors whose work has been described operations were supervised by the following men: C. R. Loving, superintendent, Granite Bituminous Paving Co., St. Louis; Mike Curran, superintendent, O'Dell & Riney Construction Co., Hannibal, Mo.; Richard Koss, in charge for Koss Construction Co., Des Moines, Iowa, and Chester Roweth, superintendent, Tobin Quarries, Inc., Kansas City, Mo.

★ ★ ★

## CENTRAL PLANT

## PRODUCES

## Tar Concrete

(Continued from page 72)

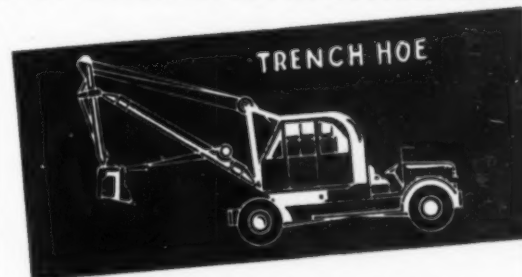
4,732 lb. of limestone aggregate and 262 lb. of tar. Requirements for aggregate gradation are indicated in an accompanying table.

Graded limestone aggregate was trucked to stockpiles at the plant from two crushing and screening outfits, set up under the management of Stewart Watson in local quarries. A P&H ⅝-yd. clamshell crane transferred the material from the stockpiles into a hopper over a Hetherington & Berner adjustable mechanical feeder

(Continued on page 94)

## TIME IS SHORT!

Save Valuable Hours with convertible MICHIGANS



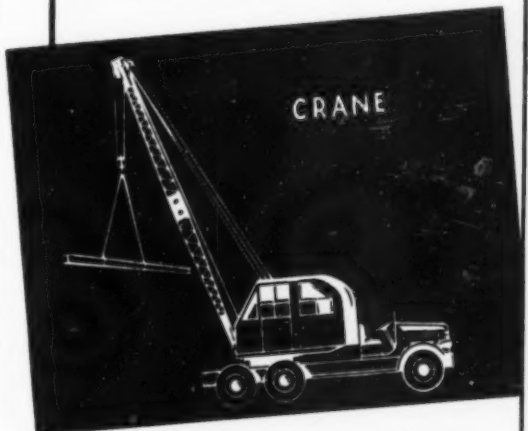
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FOUR-WHEEL DRIVE, ¾ yd. — Extra traction for extra tough going. Constant velocity joint on front axle makes steering easier. Six cylinder engine. Air Controlled.



**DAGLINE**  
DUAL TANDEM-DRIVE, ½ yd. — Unit-frame integral part of machine. Ten pneumatic tires. Two six cylinder engines — one for digging, one for travel. Air Controls speed work.



**SHOVEL**  
SINGLE AXLE, ¾ yd. — Air Controls save time on job. Built from ground up for hard service. Six cylinder gas or diesel engine. Truck Mobility.



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## TAPER ROLLED BLADE

Strongest construction open back type. Heavy section extends full width of blade from top to point of frog where strain is most severe. Blade and socket heat treated.

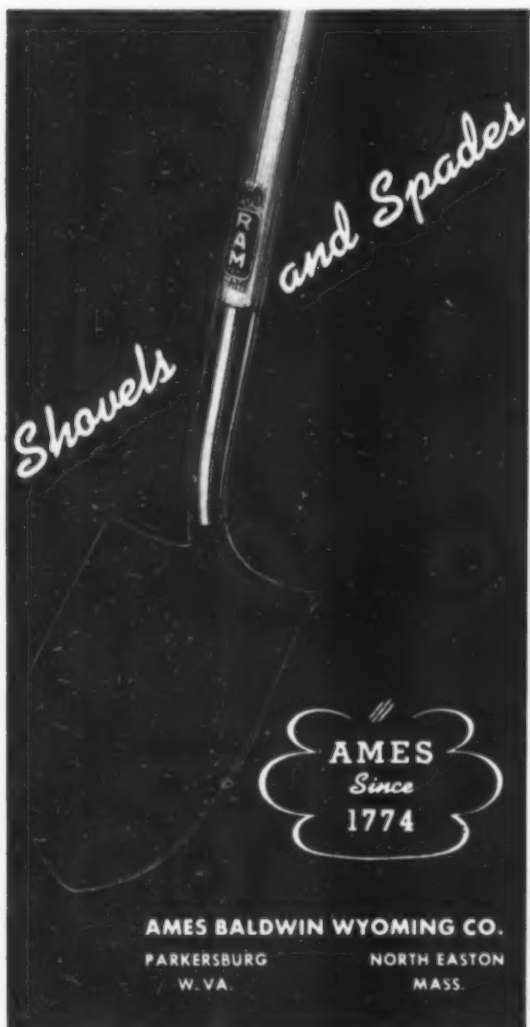
## RIVETLESS SOCKET

No rivets. Socket is smooth and elimination of rivet holes increases strength of handle.

## HANDLES

Northern ash. Attractively finished with a walnut color. Bug-proof lacquer.

• Perfect balance. Supplied in D and long handle. Round and square point.



(Continued from page 93)

which passed the graded aggregate at a controlled rate to the cold material elevator at the head end of the dryers.

Twin 48-in. by 32-ft. dryers, ingeniously supported at a steep pitch on skewed rollers and adequately heated by a pair of Korting burners in each drum, supplied dehydrated aggregate to the hot elevator at the minimum temperature necessary to meet a specification requiring that the

### GRADED AGGREGATE BITUMINOUS SURFACE COURSE Open Graded Type GRADATION REQUIREMENTS

Sieve	Percent retained	Variation tolerance for job, percent
1½-in.	0	
1-in.	0-10	
½-in.	15-30	
No. 4	35-55	±5
No. 10	55-70	±5
Passing No. 200	0-5	±2

aggregate at the time of mixing contain not more than 1 percent moisture by weight. A steam pump maintained a pressure of 120 lb. per sq. in. in the oil feed lines to the burners. Two Caterpillar diesel power plants, each one capable of delivering 95 hp. continuously and up to 125 hp. for periods of 15 min., drove all moving parts of the plant.

High-carbon tars used in the mix were heated to an application temperature within a specified range of 175-225 deg. F., the actual temperature of tar entering the mixer being held within plus or minus 10 deg. of an ideal temperature designated by the engineer. Dry aggregate was mixed for 10 sec. in the drum prior to the application of tar, and wet mixing was continued for 40 sec. after the tar had been added.

Two batches, or 5 tons, of tar concrete were carried by each truck delivering from the plant to the pavers. On the day when the accompanying photographs were made, a fleet of twelve trucks was operating on a one-way haul of nearly 9 mi.

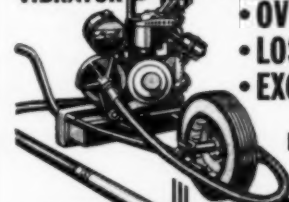
### Two-Lane Paving

Specifications stipulated that the projects were to be kept open to all traffic during the performance of the work under the contracts. No difficulty was encountered in meeting this requirement while laying the two 11-ft. tar concrete lanes jointly with a pair of Adnun black-top pavers. During the day, the paving crew kept one lane some distance in advance of the other, leaving sufficient distance between the two machines to permit necessary passage of vehicles without interference.

When the mixing plant was producing tar-concrete at a rate of 110 tons an hour, each paver in the course of an hour advanced 660 ft., distributing successive truckloads in a series of eleven moves. Trucks backed between front drive wheels

(Continued on page 96)

Equipped as a  
CONCRETE  
VIBRATOR



## Wipe Out

- OVERTIME
  - LOST MOTION
  - EXCESS MATERIAL
- On 9  
EVERY-DAY  
JOBS

with A Mall Gasoline Driven  
POWER UNIT

• Use it for Concrete Vibrating, Concrete Surfacing, Form Sanding, Sawing with Circular or Chain Saw, Wire Brushing, Grinding, Drilling in Wood, Brick, Steel or Stone, Pumping and Sharpening Tools.

Any contractor can save enough time, labor and material with this 3 H. P. Gasoline-Driven Power Unit to absorb its cost on the first few jobs. It's by far the most useful tool you could own. It can be operated in the most remote places... can be wheeled anywhere on the job... runs all day on 1½ to 2 gallons of gasoline. It is easy to start in cold weather and requires little attention. Interchangeable tools for the 9 every-day jobs listed above can be changed as quickly and easily as bits in a brace.

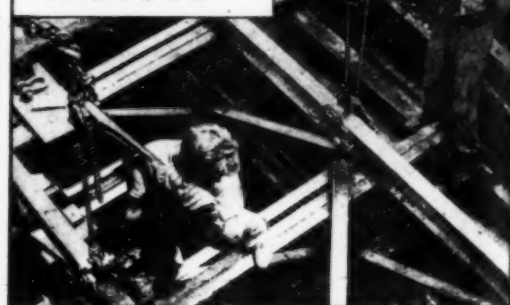
With a scarcity of time, labor and materials facing you in 1942 get the facts on this 9-job Power Unit TODAY. Plan now to motorize these manual time-consuming tasks and avoid overtime — lost motion and wasted material. A FREE Demonstration is yours for the asking — Write AT ONCE for our 1942 Catalog and Prices

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Pieces!***



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- 1—Has high oxidation stability.
- 2—Keeps rings and pistons free.
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These statements are not our say-so, but what users have found out to be *fact*... and under severe temperature and operating conditions. If you're "putting up" with an oil that delivers less, call in Shell today!

**Lubricate with tough**

**SHELL  
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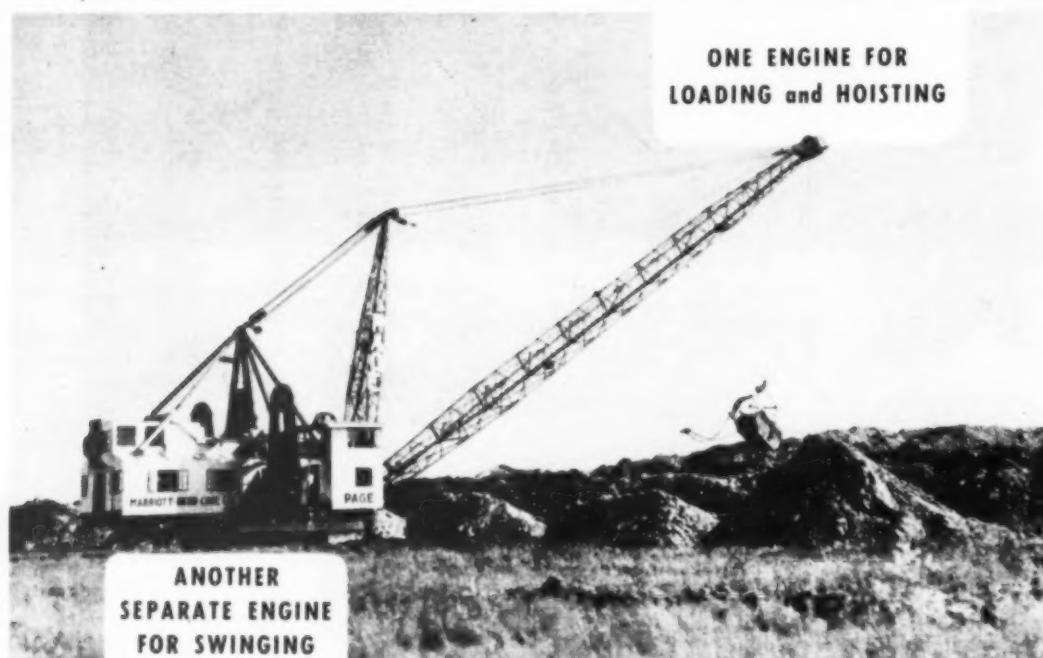
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ONE ENGINE FOR  
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(Continued from page 94)

of the paver to dump the hot material into a receiving hopper from which it was distributed by a toothed roll feeder. Behind a reciprocating cutter bar, which struck off the tar concrete to grade, two rear-drive rollers partially compacted the material. Final compaction was obtained with a Buffalo-Springfield 8-ton tandem roller which started longitudinal rolling at the outer edge of the first lane laid and worked across the pavement to the other edge in overlapping trips.

Except on superelevated curves, both stabilized base and pavement were constructed to a roof crown having a straight pitch of 1 in. in 4 ft. on both sides of the center line. The base was bladed and compacted to accurate profile prior to priming. Front wheels of the pavers traveled on the primed base, and the rear rollers rode on the tar concrete struck off by the cutter blade. By reason of the span between front wheels and rear rollers, the operation of the pavers was effective in reducing any minor inequalities in the base. The surface of the completed pavement was tested longitudinally by straightedge to a maximum tolerance of 1/4 in. in 10 ft.

#### Stabilized Base

Strata of hard limestone in the vicinity of the two highway projects are found in happy combination with shale seams which furnish the proper proportion of binder for a stabilized mixture. Both Stewart Watson and P. W. Ryan Sons produced material for stabilized base, consisting of graded aggregate and binder, by setting up crushing and screening plants in local quarries where hard limestone was available in combination with shale.

Stabilized base was constructed to an

#### STABILIZED GRADED AGGREGATE BASE COURSE

Gradation Requirements for Mixture of  
Graded Aggregate and Binder Soil

Sieve	Per Cent Retained
1-in.	0
3/4-in.	0-15
1/2-in.	10-35
No. 4	35-65
No. 10	50-75
No. 40	70-85
No. 200	85-95

Fraction passing No. 200 sieve shall be less than one-half fraction passing No. 40 sieve.  
Fraction passing No. 40 sieve shall have plasticity index from 0 to 5 and liquid limit of not more than 25.

overall width of 41 ft., including feather edges beyond the shoulder lines, where the stabilized material tapers off on 1 to 4 side slopes. The plans called for construction of base in varying depths of 2 to 8 in. to strengthen existing traffic-bound gravel surface which, in the past, had been bladed and given an oil treatment to form a skin mat perhaps 1 in. thick. On the 14.26-mi. job, an estimated quantity of 357,000 cu.yd. of base material in place provided an average depth of 4 in., while an estimated 30,590 cu.yd. for the 8.82-mi.

(Continued on page 98)



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 50 hp  
 40 hp  
 30 hp  
 25 hp  
 20 hp  
 15 hp  
 10 hp  
 7½ hp  
 5 hp  
 3 hp  
 2 hp  
 1½ hp  
 1 hp



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 GIVE EVERY **TRI CLAD** MOTOR . . .

**GREAT STRENGTH  
 AND LONG LIFE**

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**BLACKHAWK**  
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(Continued from page 96)

project allowed an average thickness of 5 1/2 in.

Combination material, comprising graded aggregate and binder soil in proper proportions to meet the requirements indicated in an accompanying table, was hauled by truck from the quarry crushing and screening plants to be dumped in windrows on the existing roadbed. Motor graders thoroughly mixed the windrowed material before spreading it for rolling in layers of 3-in. maximum compacted thickness. Specifications required that construction begin at the point nearest the source of supply and that hauling units be routed uniformly over previously constructed layers to assist in compaction.

Primary compaction was effected by Bros nine-wheel pneumatic-tired rollers which satisfied specifications requiring a gross weight not less than 8 tons and minimum compression of 325 lb. per inch of tire width. Each layer was compacted with this equipment to a required density not less than 95 percent of theoretical as determined by the laboratory method of the American Association of State Highway Officials, Designation T-99. Natural moisture content of the mixture was sufficiently close to the optimum to permit compaction to densities of 140 to 145 lb. per cu.ft., exceeding the specified requirement, without application of additional water.

#### Base Prime

Completed stabilized base was primed in half widths by pressure distributor with liquid tar in the 60-125-deg. F. temperature range at a rate of about 0.25 gal. per sq. yd. The penetration prime application extended 2 ft. out on the shoulder beyond the edge of the surface course laid later. Traffic was kept off the prime during the period required for proper penetration.

#### Seal Coat

To seal the surface of the open graded tar-concrete pavement a pressure distributor applied high carbon tar heated to 175-225 deg. F. at a rate of about 0.2 gal. per sq. yd. As soon as the desired degree of tackiness developed, the seal coat was covered with 10 lb. per sq. yd. of hard rock screenings passing the 3/8-in. sieve and retained 60 to 80 percent on the No. 8 sieve and 85 to 100 percent on the No. 30 sieve. As soon as this aggregate had been applied by a spreader, a flat steel roller went over the surface of the pavement. Rolling and brooming with drag brooms continued until the aggregate was thoroughly embedded and the surface was uniform in texture.

#### Direction

E. L. Roettiger is state highway engineer of the Wisconsin State Highway Commission, and A. T. Bleck is construction engineer. The two U.S. 18 projects involving tar concrete on stabilized base were built in Division 9, T. W. Reilly, division engineer, Lancaster, Wis. Field operations

(Continued on page 100)





It is the reach not the length of the boom that counts most in dragline work. On levee work or where maximum working range is desired, boom length is not as important as the angle at which the boom can be worked without tipping the machine. Long booms mean only extra weight if the machine is incapable of handling a long boom and load at a low angle to get maximum range so necessary in dragline work. The sketch above shows a comparison in working radii of a properly balanced LIMA dragline equipped with an 80' boom and a 3 yard bucket, working at a 30° angle and a light weight unstable machine of the same boom length and capacity, but which must be worked at a 45° angle to avoid tipping. LIMA draglines are designed for dragline work. They have such important advantages as—heavy duty truck and machinery frames; proper balance, by placing the machinery well back of the center pin; and long, wide crawlers that add to the stability of the machine as well as reduce ground bearing pressure to a minimum. Remember when buying a dragline, that working radii depend on stability, not boom length.

#### IN ADDITION TO *Stability* LIMA OFFERS

BIG DIAMETER DRUMS  
ROLLER BEARINGS THROUGHOUT  
HELICAL CUT GEARS  
SQUARE LEVER SHAFTS  
QUICK CONVERTIBILITY  
INDEPENDENT CLUTCHES  
LONG, WIDE CRAWLERS  
AND MANY OTHER ADVANTAGES ✓

### LIMA LOCOMOTIVE WORKS, INCORPORATED

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# LIMA

SHOVELS,  $\frac{3}{4}$  YD. TO  $3\frac{1}{2}$  YDS. CRANES, 13 TONS TO 60 TONS  
DRAGLINES, VARIABLE



## DUAL PRIME CENTRIFUGALS



**FIRST CHOICE  
IN PUMPS!**

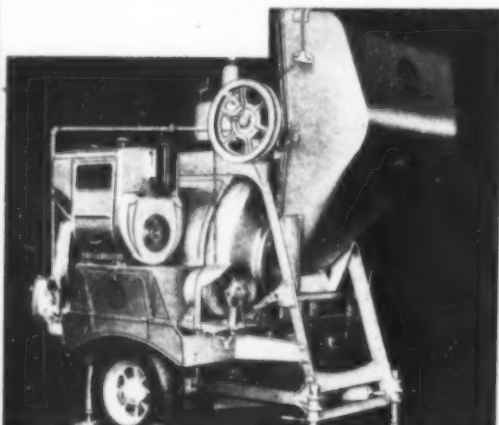


10" CMC Dual Prime moving water fast on big foundation well point job.

All sizes—have exclusive "double priming" feature. Faster, surer priming saves delays, speeds up work. A complete line from 1½ to 10" sizes.



## FAST ACTION TRAILERS FIRST CHOICE IN MIXERS!



Mix faster—move faster—last longer! Built for today's speed up demands. Quick charging—perfect mixing—faster discharge.

55, 75, 105 and 145 sizes. Buy right. Pick CMC Mixers (Concrete, Hoe-Type, Bituminous) Batches, Pumps, Power Saws, Hoists, Carts and Barrows.

**CONSTRUCTION  
MACHINERY CO.**  
WATERLOO, IOWA

(Continued from page 98)

were directed for the state by L. R. Suhr, project engineer.

Paving of the 23 mi. of highway was carried out under the active supervision of J. P. Humphries, contractor, Milwaukee, with J. C. Seual, superintendent, in charge on the job.

★ ★ ★

## Heavy Grading Required for California Freeway Extension

(Continued from page 62)

of existing highway tunnels, which are now restricted to northbound traffic. Estimates of quantities involved included 820,000 cu.yd. of earth and rock excavation. About 328,000 cu.yd. of the total excavation not required for fills was disposed of in nearby park canyon areas. The cost of the project is about \$4,000,000, including right-of-way, parks and engineering.

For the new route the cuts, of which there are five in all, have slopes of 1 on 1 and bottom widths of 60 ft., allowing for a 46-ft. paved roadway, gutters and rubble walls on either side. No berms are provided in the cuts to clear slides of material, but in the deepest cut a 75-ft. bench 40 ft. above the roadway is constructed on one side and a 10-ft. bench at the same elevation on the other side to stabilize the slopes. Excavation has been done mainly with two types of equipment: (1) Tractor-hauled carrying scrapers; (2) power shovels loading into end-dump trucks. About 20 percent of the material encountered in the cuts required drilling and blasting.

### Equipment On Job

With work on the project in its full stride, about 2,000 men were employed and the equipment, as listed by Robert J. Hatfield, resident engineer for the California Division of Highways, included the following: Ten 110-hp. tractors operating 16-cu.yd. carrying scrapers, bulldozers, sheepsfoot rollers (for consolidating fills) and rooters; one 2½-yd. and one 1½-yd. power shovels; a fleet of 40 dump trucks; nine air compressors; half a dozen concrete mixers; floodlights for night work.

For retention of the slopes of the cuts, rubble walls of greater size than previously existed in the Los Angeles area have been built. To provide aggregate for the construction of these huge retaining walls, 30,000 cu.yd. of broken and discarded concrete sidewalks, curbs, gutters and pavement were accumulated and used to

(Continued on page 102)



### YOU CAN BANK ON A BROWNHOIST BUCKET

Industrial Brownhoist buckets represent the last word in good design and construction. Light weight is combined with unusual strength. Rope wear is reduced to a minimum. Because of the clean, deep bites they take, hand shoveling is practically eliminated. Standard buckets on hand ready for immediate delivery. Write for further facts.

**INDUSTRIAL BROWNHOIST CORP.**

BAY CITY, MICHIGAN

District offices: New York, Philadelphia, Pittsburgh, Cleveland, Chicago



Get this  
**EXTRA  
VALUE**  
in  
**SHOVELS!**

ASK  
for the  
**ONLY  
SHOVELS**  
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Blade Edges  
**GUARANTEED  
SPLIT-PROOF**

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"The Borg-Warner Line"

Write for Catalog and Prices  
**INGERSOLL STEEL & DISC DIVISION**  
BORG WARNER CORPORATION  
NEW CASTLE, INDIANA

Plants: New Castle, Ind.; Chicago, Ill.; Kalamazoo, Mich.

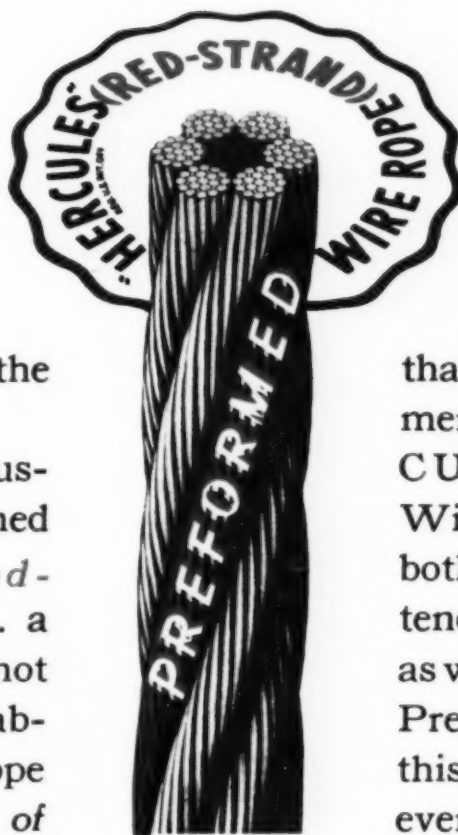


# Let's Keep Plenty of Them Flying...



**E**VERY ton of steel that can be diverted to the production of actual fighting instruments — planes, tanks, ships, guns — brings us closer to the day of Victory.

You can save steel by using longer-lasting Preformed "HERCULES" (Red-Strand) Wire Rope . . . a rope of highest quality not only as to material, but fabrication as well . . . a rope that delivers more *hours of*



*work per pound of steel.*

Add to this saving by selecting your wire rope of the specific size, type, grade and construction that best meets your requirements. Inasmuch as "HERCULES" (Red-Strand) Wire Rope is furnished in both Round Strand and Flattened Strand constructions, as well as in the Standard and Preformed types, there is, in this one grade, a *right* rope for every heavy-duty purpose.

*In order to help all wire rope users obtain maximum service from their wire rope, we publish an illustrated booklet "Practical Information on the Use and Care of Wire Rope". We would be glad to send a complimentary copy to anyone interested.*

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# How Does Moretrench Handle a Wet Job?

Queens, N. Y. \$1,000,000 Sewer under construction—in the dry. Andrew Catapano, Contractor



1

An experienced engineer plans the wellpoint set-up to dewater your particular work efficiently in the most economical way.

2

A-1 equipment, shipped from stock, arrives in good condition on the job—when you want it.

3

A skilled demonstrator, veteran of a hundred jobs, installs the system, instructs your men in its care and operation, and makes sure you're going along "in the dry" before he leaves.

Does it cost a little more? Yes—at first! The final cost is a different story. Less units—lower installing and operating expenses—guaranteed results. These are what count in the end. Let us show you on your wet work.

## MORETRENCH CORPORATION

90 WEST STREET, NEW YORK

ROCKAWAY, N. J.    JOLIET, ILLINOIS    NEW ORLEANS, LA.

(Continued from page 100)

advantage as a substitute for reinforced concrete.

Directing the project is C. H. Purcell, state highway engineer, with S. V. Cortellou as district engineer, A. N. George, district construction engineer and Robert J. Hatfield, resident engineer.

★ ★ ★

## Air Base Paved

### With Truck-Mixers and Concrete Spreaders

(Continued from page 46)

600x100 ft., the foregoing surfaces connected by curved strips of Class A concrete. All paving is 9-6-9 in. laid in 25-ft. strips—a total of 75,000 cu.yd. of Class A concrete. Storm drains and water line were also included.

Contract for the concrete was made with Harry Polk, who employed a fleet of eight Jaeger 4-yd. truck-mixers of high-discharge type. Their high discharge design enabled the truck mixers to extend their discharge chutes 4 ft. within the forms on both sides of the 25-ft. wide grade, forming two windrows more than 40 in. high and facilitating the work of the concrete screw-spreader.

Two 85-ton, 3-compartment bunkers, served by two clamshells, were set up at a railway spur 2,000 ft. from the end of the long runway. The manually operated 2-yd. batchers required three drops to charge 4.3 cu.yd. of concrete into the truck-mixers. Water was batched with aggregate, using automatic water meters, and the truck mixers were then driven 200 ft. to the cement charging hopper. With this setup an average of 2 min. was maintained for loading a complete 4.3-cu.yd. batch consisting of 5,272 lb. of sand (specific gravity 2.66, solid weight 166 lb. per cu.ft.); 4,205 lb. of No. 3 (3/4-3/8-in.) rock and 5,060 lb. of No. 2 rock (1 1/2-3/4-in.) both of 2.65 specific gravity, plus 1,192 lb. of water and 22 sacks of Monolith sulphide-resisting cement. Sand ran 5 per cent moisture. Resulting concrete was minus-1-in. slump.

With 2 min. for loading, a 10-min. round trip haul, 2 to 2 1/2 min. for jockeying into position and 2 1/2 to 3 min. for actual discharge, the eight truck-mixers each averaged 7 trips per 2 hr.—a production of 250 lin. ft. per hour of the 9-6-9-in. slab, 25 ft. wide.

Because of the weight of the paving equipment required for 25-ft. span, extra gage 7/32-in. road form was installed. Tractor-drawn subgrader prepared the fine grade. The concrete spreader, which distributed the roughly windrowed concrete, is equipped with transverse screw

(Continued on page 104)



**NEW RIVER BRIDGE**, Wythe Co., Va. This treacherous river dictated use of Lehigh Early Strength Cement to

shorten construction time of footings and piers; which would also in turn permit earlier start of steel work.



*Now*

**... A MORE IMPORTANT  
ROAD-BUILDING TOOL THAN EVER!**



**STATE HIGHWAY**, Petersburg, Va. Use of Lehigh Early Strength Cement made detours unnecessary. Paving two lanes at a time left two lanes always open to traffic.

Yes, we mean Lehigh Early Strength Cement!

Roads, like rifles, are a part of the nation's equipment for defense. Now's no time to dawdle, getting new roads done or old roads fixed. If you have a road contract, speed it up with Lehigh Early Strength Cement.

Here's the vital point: Concrete made with Lehigh Early Strength Cement is as strong in 24 to 48 hours as week-old concrete made with normal cement. This speed helps you road-builders do your work at the pace our emergency demands. For instance:

- ... You can often move equipment over the new concrete in 24 hours;
- ... When traffic must be maintained along the route, quick use of concrete reduces traffic hazard;
- ... Quick opening of pavement at intersections reduces cost and nuisance of detours;

... Paving half-at-a-time with quick-use concrete keeps road open all the time.

If the country were not at war, we'd say figure your next job both ways—with normal and with early strength cement. Today there isn't time; use Lehigh Early Strength Cement.

**Lehigh**

**EARLY STRENGTH CEMENT**  
for service-strength concrete in a hurry!

**LEHIGH PORTLAND CEMENT COMPANY** • ALLENTOWN, PA. • CHICAGO, ILL. • SPOKANE, WASH.

**"WE HAVE USED THIS BUCKET FOR 2 1/2 YEARS AND RECOMMEND IT TO ANYONE WHO DEMANDS STEADY AND MAXIMUM PRODUCTION."**

**THE CITY EXCAVATING CO.**

"We have long since realized," writes A. J. Carlozzi, president of The City Excavating Co., Cleveland, Ohio, "that your 1/2 yard Multiple Rope Bucket gives us far better service than any other make previously used, and we have used several other makes of buckets."

Williams Buckets are truly "built to last and move dirt fast". Each type we build has numerous features which have been developed by over 35 years of bucket engineering for contractors, dredging companies and steel mills. Always a leader in welded design, Williams Buckets now feature welded construction at vital points, using rivets only at certain sections where ultimate replacement may be required. Make your next bucket a Williams!



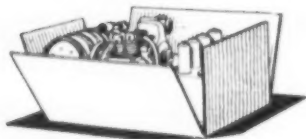
Send for individual bulletins giving full information on each type of Williams Bucket.

**WELDED**  
ROLLED STEEL CONSTRUCTION  
for GREATER STRENGTH and SPEED

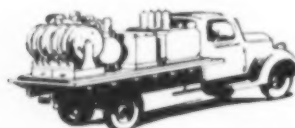
**THE WELLMAN ENGINEERING CO.**  
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**WILLIAMS Buckets**  
built by **WELLMAN**

**For Quick, Sure,  
"On-the-Job" Lubrication  
Specify GRACO  
CONVOY LUBERS**



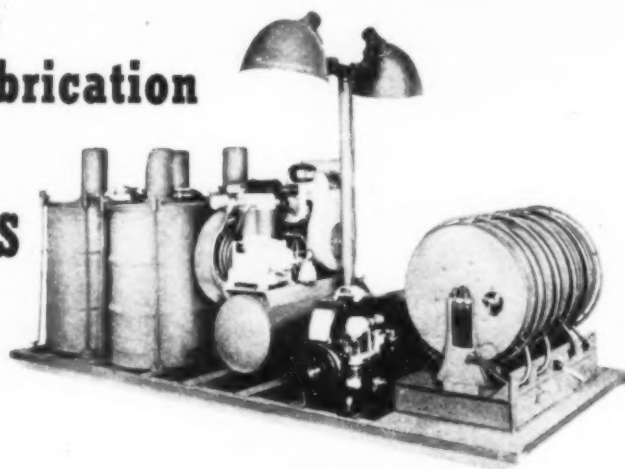
Completely assembled and boxed in one crate, Convoy Lubers can be unpacked, mounted on a truck or trailer, loaded with lubricants, and operating in a matter of minutes.



Mounted on truck or trailer Convoy Lubers bring pressure lubrication to the job, save time and money with complete modern lubrication facilities, with every hand gun, tool, adapter, and accessory at the operator's finger tips.



When truck or trailer is needed for other work, the Convoy Luber can be removed intact and full speed operation continued from the bare ground or a suitable platform.



★ Graco Convoy Lubers, for complete lubrication of construction equipment **ON-THE-JOB**, include engine-driven air compressor, powerful pneumatic lubricant pumps dispensing from original containers, one 50-ft. air hose and four 30-ft. lubricant hoses mounted on reels, tool box, and complete tool and accessory kit. In addition, some models like that illustrated, include a 110-volt lighting plant and flood lamps for night operation. The complete unit is assembled at the factory on a heavy steel frame and shipped to you ready to operate.

Stop lubrication delays . . . write or wire for prices and details.

**GRACO**  
**GRAY COMPANY, INC.**  
Minneapolis, Minn.

(Continued from page 102)

split in right- and left-hand sections which are independently reversible. These screws re-mixed and spread the harsh material across the grade and also compacted it against the forms. The spreader was equipped to strike off in advance of the two-screed finishing machine, which was also equipped with tamper for compacting the 9-6-9-in. slab. Capacity of this spreader-finisher team, both Jaeger units, easily exceeded the production of the truck-mixer plant or 250 lin. ft. per hour of 25-ft. slab.

A joint cutter for longitudinal and transverse joints and transverse float completed the work behind the finisher.

★ ★ ★

**Lighter, Leaner, Drier**

**Concrete Contains**

*Aerating Admixture*

(Continued from page 56)

to develop as much strength as possible from the cement content, and the water was correspondingly held to a minimum. Specifications required a 28-day modulus of rupture averaging not less than 650 lb. per square inch. Increased yield resulting from introduction of the alkyl sulphate frothing agent was compensated for by reduction in the proportion of sand.

A six-bag batch of 32.4-cu.ft. volume actually was used on the job. The 27E paver which mixed all the concrete for

**GRADING REQUIREMENTS FOR  
THREE SIZES OF AGGREGATE**

Screen or Sieve	4A	10A	SAND
	Per Cent Passing		
2 1/2-in.	100		
2-in.	95-100		
1 1/2-in.	65-90	100	
1-in.	10-40	95-100	
3/4-in.		35-65	
3/8-in.	0-5		100
No. 4		0-8	95-100
No. 8			65-95
No. 16			35-75
No. 30			15-55
No. 50			10-30
No. 100			0-10

the job handled this size batch without difficulty.

Orvus, the sodium lauryl sulphate added to the concrete mixture, came to the job in the form of a white paste in 12 1/2-lb. jars. For easy handling and for rapid dispersal of the admixture throughout the batch in the mixing drum, the paste was dissolved in a water solution of such concentration that 1 qt. of the solution could be added to each batch.

As stated in the specifications for the job, the quantity of admixture to be in-

(Continued on page 106)



**170,000 Tons  
in 4½ Months**

# TELSMITH PLANT

**speeds  
construction  
of Army  
Ordnance  
Works**



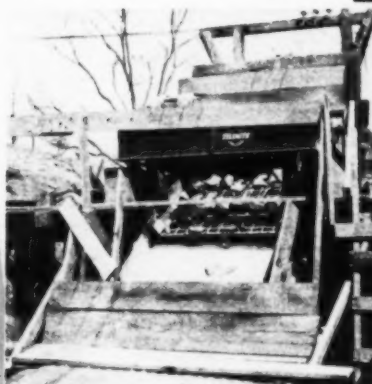
★ For the new powder bag-loading plant at the New River Ordnance Works near Radford, Va. 300,000 tons or more crushed aggregate will be required. To supply it the Pendleton Construction Corp. of Wytheville, Va. with the co-operation of Tel-smith engineers built the co-operation of Tel-smith engineers built a new crushing plant near Dublin, Va. It is Tel-smith equipped throughout!

Actual crushing began March 13, 1941, and by the end of July, 170,000 tons of aggregate had been turned out. The capacity naturally varies—from 150 tons to 100 tons per hour—depending upon the sizes produced. Six different sizes of finished products can be made.

The plant amply demonstrates Tel-smith planned production. Properly co-ordinated and balanced, all units are working smoothly—giving flexibility as to sizes, and dependability as to quantity and quality of product. That's as typically Tel-smith as the low cost per ton.

Each of the three Tel-smith Crushers (Jaw, Gyrasphere, Roll) is driven by its own Diesel. A Diesel-electric generator supplies current for the individual electric motor drives on the Tel-smith Apron Feeder, the two Tel-smith screens and the four Tel-smith-Barber-Greene Steel Frame Belt Conveyors.

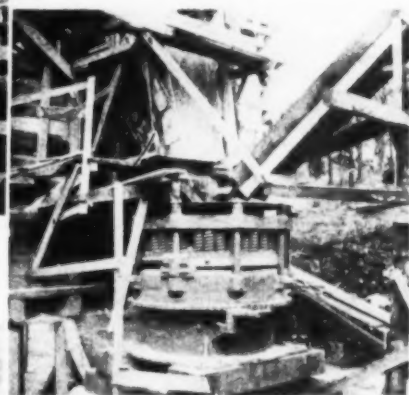
For details on Planned Plant Production by Tel-smith—get Bulletin Q-10.



Tel-smith 4'x12' two-deck Pulsator over small loading bin. Rejects from the top deck are recrushed by the Gyrasphere.



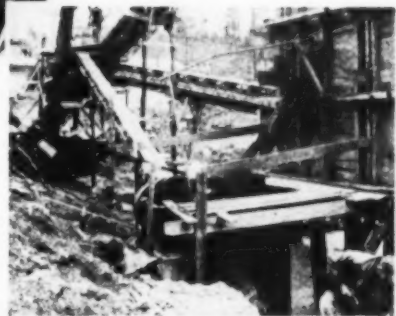
Under hopper, 36' x 12' Tel-smith Heavy Duty Apron Feeder delivers to 24 x 36 Tel-smith Roller Bearing Jaw Crusher.



No. 48 Tel-smith Gyrasphere, in closed circuit with 3-deck screen, recrushes the top deck rejects.



4'x12' Tel-smith 3-deck Pulsator over main storage bins, grades stone into three sizes.



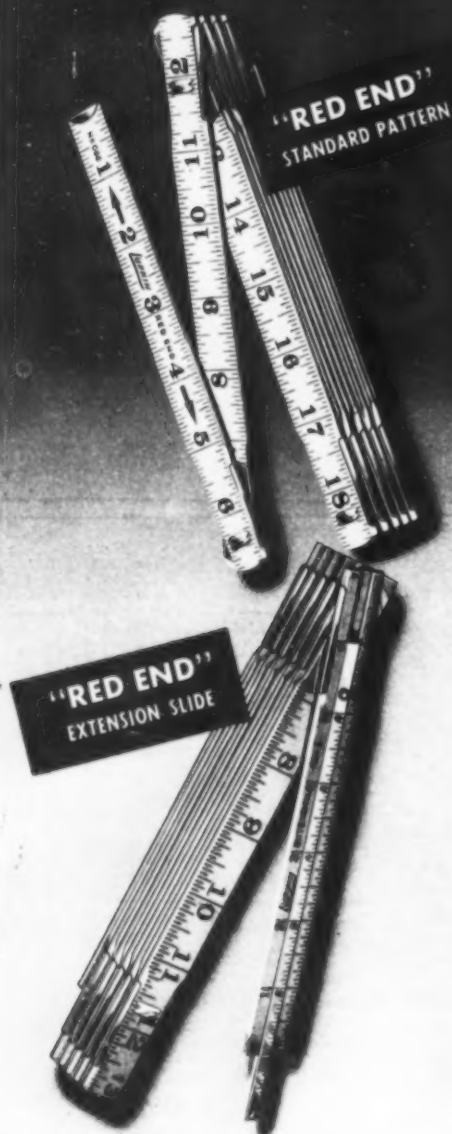
Surplus in main storage bin, of any size, is crushed to smaller sizes by 30x18 Tel-smith Roll Crusher.

**SMITH ENGINEERING WORKS, 510 EAST CAPITOL DRIVE, MILWAUKEE, WISCONSIN**

Cable Addresses: Sengworks, Milwaukee—Concrete, London Q-6  
 Room 1604—50 East 42nd St. 211 W. Wacker Drive 713 Commercial Trust Bldg. 19-21 Charles St. Vern Wheeler Eqpt. Co. Brandels M. & S. Co.  
 New York City Chicago, Ill. Philadelphia, Pa. Cambridge, Mass. Columbus, Ohio Louisville, Ky.  
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# LUFKIN

## WOOD RULES FOR CONTRACTORS



A few of the many reasons why "Red End" rules are so popular: They have solid brass joints and strike plates. Lock joints reduce end play. Sections are of finest straight grain hardwood. Graduations on both sides. Durable enamel finishes in snow white or cream. A wide variety of graduations.

See them at your dealers and write us for free Catalog.

# LUFKIN

SAGINAW, MICHIGAN • New York City

TAPES • RULES • PRECISION TOOLS

(Continued from page 104)

corporated was to be such as would cause a reduction in unit weight of the concrete of 4 to 6 lb. per cubic foot as compared with concrete of the same consistency and cement content without the admixture. In the actual construction of the pavement, it was decided to hold the loss in weight to 4 lb. per cubic foot. The admixture of 0.05 lb. per cubic yard, or 0.06 lb. per 6-bag batch, produced the desired drop in weight. Accordingly, the water solution was made up to a concentration of 0.06 lb. of Orvus per quart.

On the basis of tests and experience previously recorded, the minute voids created in the concrete by the aerating effect of the admixture are expected to improve the durability of the slab. This result presumably is gained through the action of the voids in taking up movement caused by expansion and contraction of the concrete. Use of the admixture apparently reduced surface bleeding of the concrete, thus improving the scale-resistance of the slab.

### CONCRETE MIX

#### Proportions of Ingredients per Sack of Cement

INGREDIENT	DRY WEIGHT
4A Gravel .....	225 lb.
10A Gravel .....	224 lb.
Sand .....	225 lb.
Cement .....	94 lb.
Water .....	42.6 lb.

As shown by an accompanying photograph, the sodium lauryl sulphate admixture was dissolved in water in two 50-gal. drums carried on a platform at the side of the mixer. After a batch had been dumped in the mixer skip, the workman in charge of the admixture poured a 1-qt. dipperful of the solution on the dry materials. As indicated by the table of proportions of concrete ingredients, less than 31 gal. of water, including moisture in the aggregates, was used in a 32.4-cu.ft. batch. The batchmeter of the Multi Foote 27E single-drum paver was set to give a minimum of 60-sec. mixing.

### Concrete Spreader

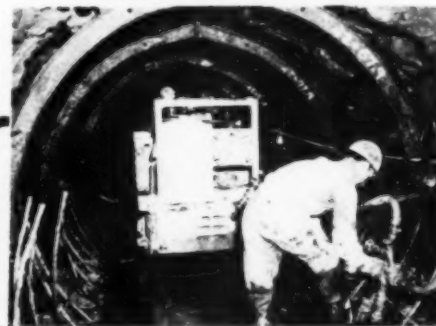
Mixed concrete was dumped by the boom bucket of the paver on the special sand-gravel sub-base inside the forms. A Jaeger screw-spreader distributed the concrete uniformly across the width of the 11-ft. lane and struck it off to desired depth and grade. In constructing the first lane, the spreader traveled on the two lines of steel forms, and in distributing concrete for the second lane it rode at one side on the completed pavement of the first lane. Mounted on the spreader was a gasoline-powered generator which supplied energy to a Jackson electric vibrator handled by one man to consolidate concrete by internal vibration along the edge forms and adjacent to expansion joints.

After the mass of concrete had been manipulated by the screw-spreader and vibrated along the edges of the lane, the

(Continued on page 108)

# COMMERCIAL

GIVES YOU EASIER,  
FASTER, AND SAFER  
CONSTRUCTION ON...

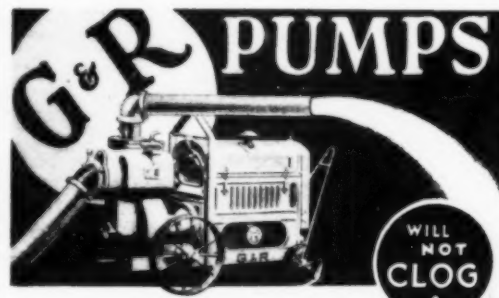


### ... JOBS SUCH AS THIS SMALL DIAMETER WATER DIVERSION TUNNEL

On all tunneling jobs, both large and small, the utilization of COMMERCIAL Tunnel Supports is, along with well planned procedure, added assurance of an easier, safer and speedier job. For instance, here's a small diameter water diversion shaft ... the Hollywood Tunnel of the California Metropolitan Water District System ... COMMERCIAL Supports played a great part in this tunnel's construction ... saved days of time ... provided improved working conditions.

In types and shapes for every kind of ground ... for every size tunnel ... COMMERCIAL Supports are ideal for your next job. Write for details.

The COMMERCIAL SHEARING &  
STAMPING CO.  
YOUNGSTOWN, OHIO



### The Most DEPENDABLE Pump For The Least Money

Claims of fastest priming, highest suction lift, more gallons per minute, etc., do not pump water. On the job, the pump must do its own talking, and with dirty water, many a pump is inclined to stutter—and stop.

Let G & R Pumps tell you their own story on any job. They will deliver as much, and usually more, water under any condition, than any other pump. We will ship you one and let you be the judge.

Remember this about G & R Pumps—THEY WILL NOT CLOG—THEY ASK NO TIME OUT. Play safe! That is why more contractors are standardizing on G & R Pumps than on any other make.

Distributors in 100 principal cities are ready to make prompt delivery of the G & R Pumps you need.

THE GORMAN-RUPP CO. Mansfield, Ohio



*Remember This \$500,000 Fire?*

***It Won't Happen Again—All Windbreaks and Covers are now FIRE CHIEF Finished***

Six months ago, 300,000 sq. ft. of flammable canvas, used in the midwestern construction job shown above, blazed to a \$500,000 loss in canvas, scaffolding and building damage.

The contractor decided then and there to strike out the fire hazard of flammable canvas from future construction work.

He purchased FIRE CHIEF Finished Duck — with the permanent fire-resisting finish that won't wash out — for all his new tarpaulins and windbreaks.

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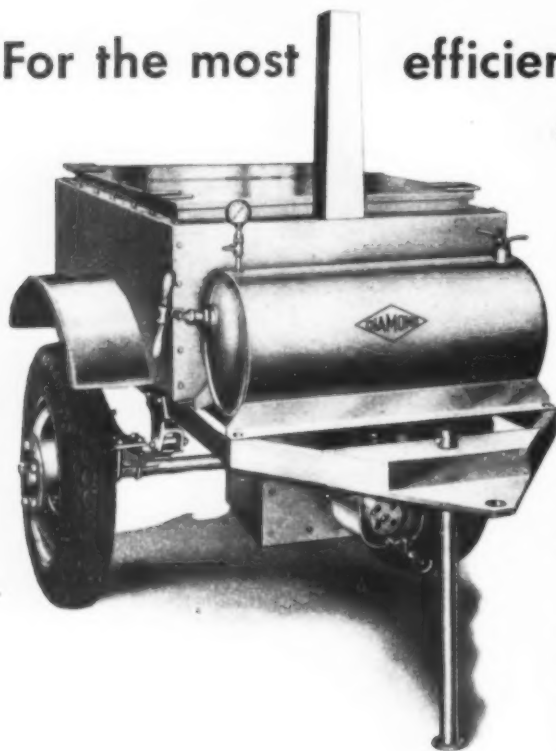
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(Continued from page 106)

top surface showed indications of grout at least partially adequate for finishing. Additional mortar was brought to the surface and the entire mass of concrete was further consolidated by the action of a Jaeger-Lakewood two-screed finishing machine operating a bullnosed front screed which carried a vertical strikeoff board equipped with two Jackson electric vibrators hooked up to a 2-kva., 110-v. gasoline-generator set mounted on the deck of the finisher. The finishing machine ordinarily made two trips over the slab, operating the vibrators on the first trip only. After the second trip, the concrete was ready for floating, straight-edging and final finishing. Completed pavement was cured under the wet burlap for 24 hr. and under well-soaked straw for 7 days.

### Sealing Joints

Premolded bituminous fiber filler was placed in the 1-in. expansion joints on 120-ft. centers. At 20-ft. intervals between these joints, 1/4-in. contraction joints 2 1/2 in. deep were cut in the concrete with a steel blade after the finishing machine had made its second pass.

To seal the top 1/2 in. of the expansion joint and to fill the transverse contraction joints and the longitudinal center-line joint between lanes, the specifications called for a compound made up of vulcanized latex material mixed on the job with asphalt oil and hydrated lime. Vultex, a product of the General Latex & Rubber Co., Cambridge, Mass., was used in the compound in the proportion of 30 parts, by weight, with 70 parts of asphaltic oil and 2 parts of hydrated lime. Materials were carried on a truck, which moved along with the workmen as the joint sealing progressed.

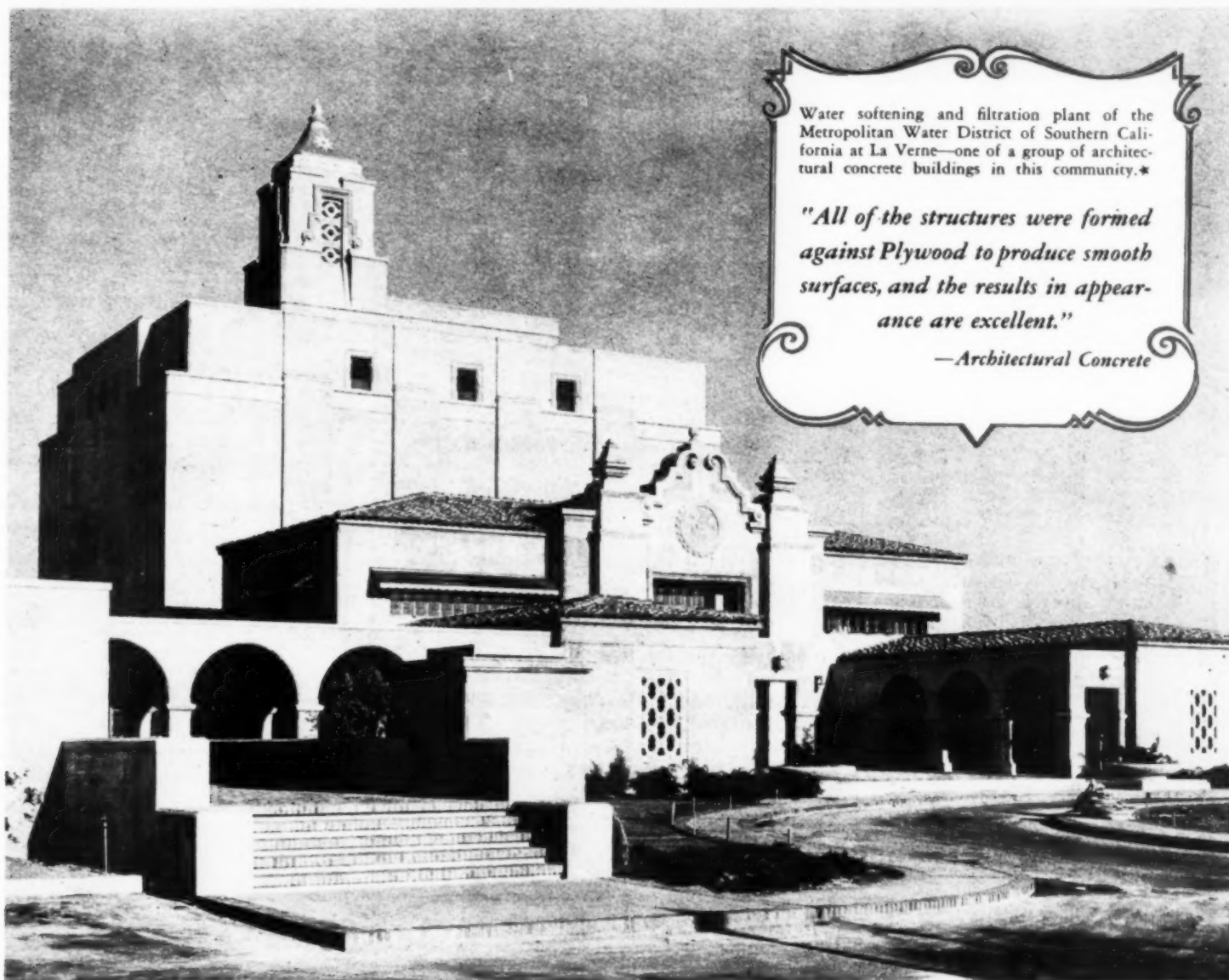
Compound was mixed in small quantities of 5 to 10 gal. for immediate use by the men who were sealing the joints. Hot asphaltic oil required in mixing the compound was maintained at a temperature of 85-95 deg. C. (185-203 deg. F.) in a kettle of about 25-gal. capacity mounted on a steel two-wheeled cart. The compound was mixed in a smaller tank of about 10-gal. capacity supported on steel legs.

In mixing a batch of compound, the workmen poured heated asphalt into the 10-gal. pot and added the proper quantity of hydrated lime, which was thoroughly mixed with the asphaltic oil before any of the liquid vulcanized latex material was introduced. The latter material, consisting of rubber particles dispersed in an ammoniac solution, was kept in sealed containers to prevent evaporation of the emulsifying agent. About half of the required quantity of Vultex first was added to the mixture and thoroughly stirred until no streaks were visible. As a final step, the workmen poured the remainder of the liquid latex solution into the pot and continued stirring until a homogeneous mixture of uniform consistency was obtained. The entire mixing operation required only a few minutes.

Hand pouring pots were used in sealing

(Continued on page 110)





Water softening and filtration plant of the Metropolitan Water District of Southern California at La Verne—one of a group of architectural concrete buildings in this community.\*

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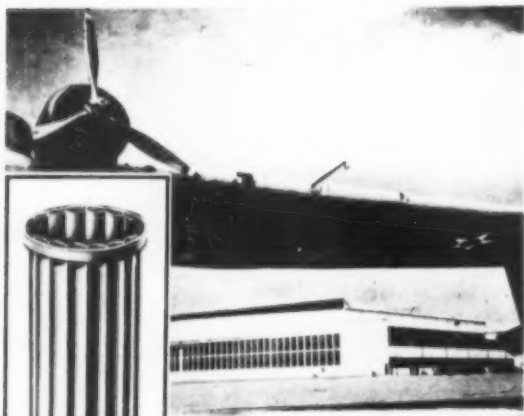
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\* F. E. Weymouth was general manager and chief engineer of the entire project until his death, when he was succeeded by Julian Hinds, his assistant chief engineer in charge of design. Daniel A. Elliot was the architect; L. H. Tutill, the concrete technologist.



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**THE UNION METAL  
MANUFACTURING CO.**

Canton, Ohio

(Continued from page 108)

the joints, as indicated by a photograph. To prevent tackiness and traffic pickup, the exposed surfaces of the joints were dusted with hydrated lime.

Because of the experimental nature of the project, specifications stipulated that one brand of cement was to be used for the entire job. Huron cement, made in Alpena, Mich., was hauled 50 mi. to the batch plant in large-capacity covered dump trucks from unloading docks at Muskegon on Lake Michigan. At the batching plant the bulk cement bin and two sets of aggregate bins were set up in line for straight drive-through by the two-batch trucks. A Butler 300-bbl. bulk plant took care of cement, while coarse aggregate was handled by a two-compartment Johnson bin and sand by a Blaw-Knox bin. The sand and two sizes of gravel were loaded into the bins from stockpiles by a clamshell crane.

On the day when the accompanying photographs were made, the paving outfit built 1,700 ft. of 11-ft. lane in about 9 hr. Allowing 3 per cent over-run, which was about average for this portion of the job, the day's progress called for production of considerably better than 45 of the 32.4-cu.ft. batches per hour.

## Direction

Design and construction features of the 3-mi. project on the Grand Rapids East Belt were set up under the general administration of G. Donald Kennedy, state highway commissioner, Michigan Highway Department, and of Harry C. Coons, deputy commissioner—chief engineer, with J. W. Kushing in particular charge as research engineer. Construction operations were carried out under the general supervision of J. G. Schaub, engineer of construction and operation, with W. D. Theeringer, project engineer, in charge on the job.

L. W. Edison, contractor, Grand Rapids, Mich., directed construction work on the project with the active assistance of Haynes Edison. For Johnson & Greene, of Whitmore Lake, Mich., subcontractors on grading, Frank Ruffolo was superintendent on the job.

★ ★ ★

## White Cement Floor

## IN BOMBER PLANT

(Continued from page 58)

ing area is a 6-in.-thick slab of gray concrete reinforced with 6x6-in., 42-lb. wire mesh. In the main assembly aisle, however, this wire mesh reinforcement is supplemented by 1/2-in. steel bars spaced 18 in. on centers in both directions and the gray concrete floor slab, 5 3/8 in. thick in the

(Continued on page 112)

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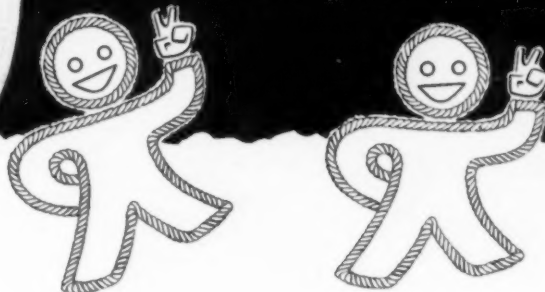
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**FLOOR SANDERS**



**PAINT SPRAYERS**



**PLANT DUSTERS**





(Continued from page 110)

main aisle, is surfaced with a  $\frac{3}{8}$ -in. thickness of white cement mortar, poured monolithic with the base.

The white floor surface is a 1.2½ mix of clean, white silica sand and Atlas white cement, to which a hardener is added. Separate mixers were required for preparing the white mortar and the gray concrete base for the two-course floor construction. For the white cement mortar a mixing time of at least 1 min. was specified. The light-reflecting surface layer was poured monolithic with the gray concrete base as soon as the latter had begun to harden, but before it had taken its final set. The mortar was struck off to specified  $\frac{1}{2}$ -in. thickness, as soon as possible after placing, with wood templates pulled along pipe screeds supported with their tops at finished floor level. After the white topping was struck off the pipe screeds were removed. When the white mortar had hardened sufficiently it was finished, first, by using a Whiteman gasoline-powered machine with three rotating trowel blades, as illustrated, and, finally, by hand floats.

Curing operations involved the application, by spraying, of two coats of a colorless solution of sodium silicate and water (1 part sodium silicate to 4 parts water), the first coat being allowed to dry before the second was sprayed on. When the second coat of curing solution had dried, the finished floor surface was covered with weatherproof Sisalkraft paper in widths of at least 13 ft. 6 in., having edges lapped 3 in. and sealed with latex cement. When in place the paper blanket over the white cement floor surface was covered with a 1-in. thickness of clean sand, which was not wet after it had been spread. This protective covering was left in place until all construction operations which might stain or mar the white floor were completed.

★ ★ ★

## Defense Traffic Served

## BY REVAMPING NEBRASKA ROAD

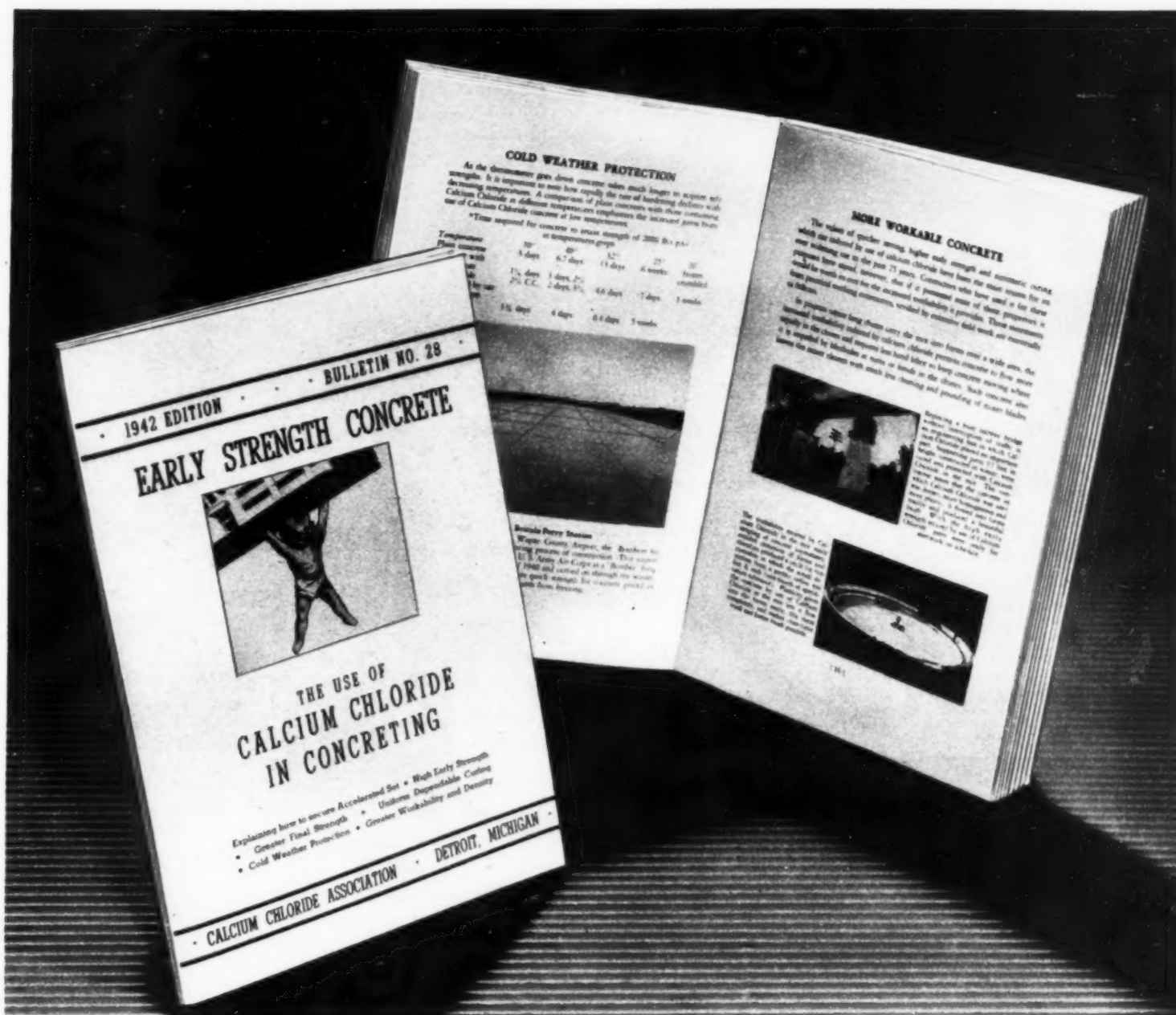
(Continued from page 74)

pavement plan, which called for salvaging and utilization of old slab in places, and by contract specifications which required maintenance of vehicular traffic over the existing road. The latter requirement was specific with regard to construction and maintenance of satisfactory detours around highway junctions.

A 2-mi. stretch on new location offered the only opportunity for continuous runs

(Continued on page 114)





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Sixty-four pages of latest data helps you speed up cold weather concrete work. This new concreting manual explains cold weather protection — shows how to secure high early strength and greater workability. It gives latest data from the National Bureau of Standards on the effects of low temperatures and shows how to offset the retarding action of cold weather.

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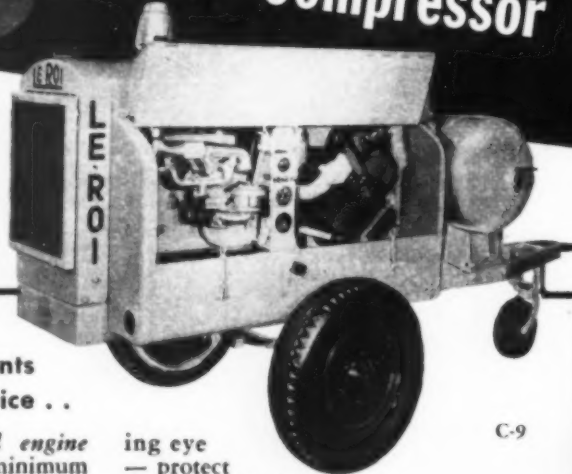
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*Other models 60 to 420 c.f.m.*

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(Continued from page 112)

by the paver on both roadways of the divided four-lane highway. The big mixer turned out 1,385-cu.yd. batches, slightly less than its working capacity, on a cycle which comprised a total of 70 sec. mixing for each batch in the two drum compartments. On the basis of daily progress records kept by the engineers, the paver normally averaged better than 50 batches an hour on straight runs and on at least one day maintained an average of more than 61 batches per hour. A full paving day for this machine was 14 hr., made up of two 7-hr. shifts, although many days were shortened by the spotty distribution of the work and by other causes. The third paving shift used a smaller mixer.

### Second Paver

In addition to 153,000 sq.yd. of regular reinforced pavement, on which the big paver operated, the contract included more than 3,000 sq.yd. of special reinforced slab in pavement widening, cross-overs and other supplementary areas. For the particular purpose of building special pavement without diverting the double-drum paver from the main job, the contractor used as a secondary unit a Koehring 27E single-drum mixer batched from the same plant. To avoid confusion and loss of time at the batching plant, which was not equipped with a selective system for instant alternation between batches of different weights, the smaller paver operated at night on the third shift. Ingenious rolling light towers, fitted with telescopic tubular masts which could be readily raised and lowered, furnished lighting for night work on pavement.

Paving of the main highway was simplified to a degree by using the 27E mixer to build one junction with the old road 1½ mi. south of Omaha. Remaining portions of the main roadways were paved by the 34E unit in a series of about twelve moves. Shorter moves up to 1¼ mi. in length were made by the paver under its own power, but the big mixer was transported by truck on one 3½-mi. transfer.

### Concrete Pavement

Reinforced-concrete roadways for the divided four-lane highway are 22 ft. wide, of 9-7-7-9-in. cross-section, with the 9-in. thickened edge reducing to 7 in. on a straight taper in 3 ft. Roadways were constructed to full 22-ft. width with a longitudinal center-line joint of the cleft type filled to within ¼ in. of the pavement surface with 2½x¾-in. bituminous material. Under the center-line joint, the two halves of the slab are tied together with ½-in. bars 4 ft. long on 5-ft. centers. Each half of the pavement is reinforced with welded wire mesh in sheets 10½ ft. wide, placed 2 in. below the surface.

Special provisions of the contract required that premolded bituminous filler of the non-extruding type for 1-in. expansion joints, spaced 120 ft., c. to c., be set with the top edge 1½ in. below the surface of the finished pavement and that the joint be sealed with a hot-poured rubber com-

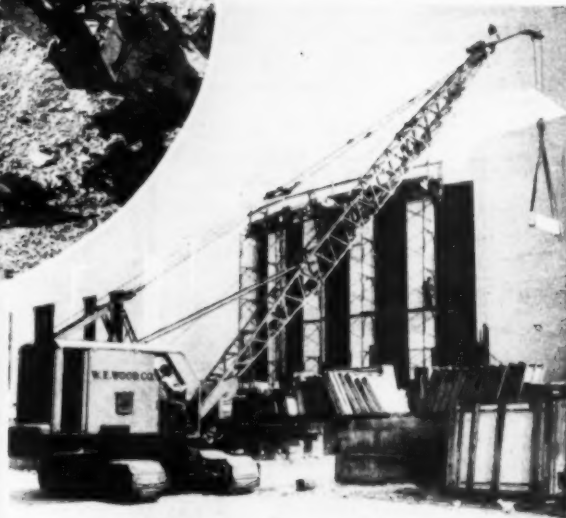
(Continued on page 116)



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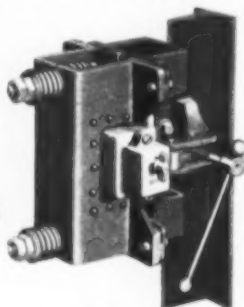
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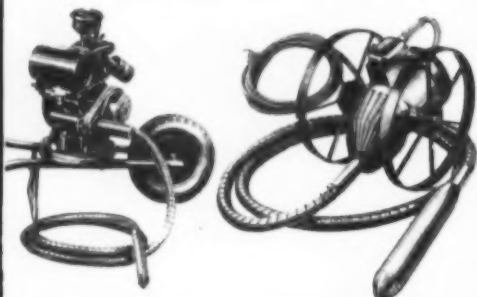


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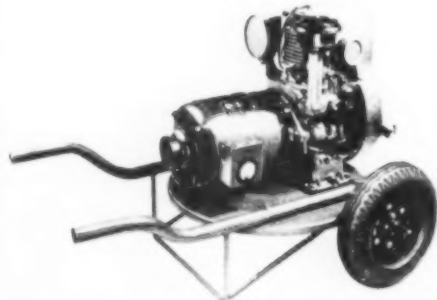
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(Continued from page 114)

pound. Similar provisions applied to the transverse contraction joints on 40-ft. centers between expansion joints, with the difference that  $\frac{3}{8}$ x $2\frac{1}{2}$ -in. premolded filler was to be set  $\frac{1}{2}$  in. below the surface for sealing with hot-poured compound. Load transfer assemblies supporting  $\frac{3}{4}$ -in. dowel bars on 15-in. centers were installed both in expansion joints and at contraction joints. At expansion joints, the two 11-ft. lanes of the 22-ft. roadway were reinforced with bent corner bars,  $\frac{1}{2}$  in. by 12 ft.

### Concrete Mix

As frequently is true of concrete jobs in this part of the United States, where large-size aggregates are not economically procurable, the mix was made with a single sand-gravel aggregate meeting the Nebraska specifications. Accompanying tables give the gradation requirements for this

### Gradation Requirements for Sand-Gravel Aggregate

	Total percent retained	
	Min.	Max.
1-in. ....		0
No. 4 .....	10	55
No. 10 .....	45	70
No. 20 .....	60	85
No. 30 .....	75	95
No. 100 .....	95	100
Total percent passing No. 200 sieve (removed by washing) ....		3.0
Clay lumps, percent by weight ....		0.5

aggregate and the specified limitations for proportioning the concrete mix. Platte River sand-gravel was shipped to the job about 25 mi. from the plant of the Lyman Richey Sand & Gravel Co. at Valley, Neb. The cement came from the Ash Grove mill, Louisville, Neb.

As specifications require seven bags of cement per cu. yd. for sand-gravel concrete, a 1.385-cu.yd. batch for the large paver needed 9.695 sacks, or 911 lb. Aggregate had to be stockpiled at least 24 hr. for draining before it could be used. The two batchers under the aggregate bins

### Table of Proportions for Sand-Gravel Concrete

Sand-gravel per sack of cement.....\*405-425 lb.  
Maximum total water per sack of cement .....48 lb.  
Cement per cubic yard (fixed quantity).....7 sacks  
\*These minimum and maximum weights of aggregate are for saturated, surface-dry aggregates having a specific gravity of 2.62. Corrections are made for aggregates having different specific gravities.

ordinarily weighed out a total of about 4,130 lb. of sand-gravel, including moisture, for each batch.

### Subgrade

In accordance with specifications, embankments for the highway were built of soil containing within 4 percent of 90 percent optimum moisture content. The soil was spread in 6-in. loose layers which were compacted to at least 90 percent of maximum density by action of the hauling equipment and of sheepfoot and flat steel rollers. For the top 6 in. of subgrade, the

(Continued on page 118)

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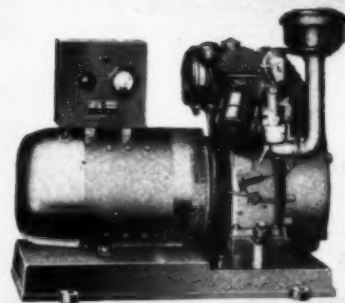
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405-13 Southwest Blvd., Kansas City, Mo.





"A guy can really move dirt with these Bakers," says Clyde Yeager, operator of a Model "M" A-C with Model 208 Bulldozer for T. M. White Co., Contractors, on widening of viaduct and approaches to U. S. 14 at Park Ridge, Ill. 5,000 yards was a push-over for this Baker!



## Now more than ever you need **BAKER** Hydraulic Bulldozers

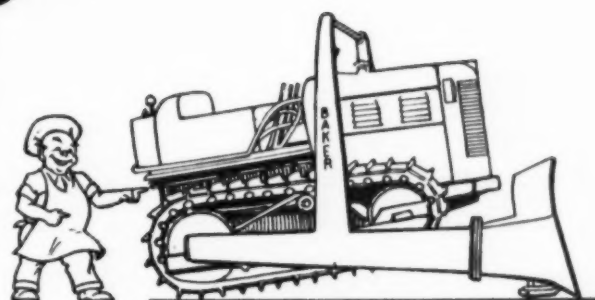
★ Greater Output — direct down pressure, easier control, greater moldboard area score bigger yardages every shift.

★ Less Maintenance—they'll do more with less wear and tear on the tractor, the hydraulic power unit and the bulldozer; conserving manpower and vital replacement parts, aiding greatly in defense.

★ More Flexible—three different moldboards fit one frame; can be changed in a few minutes—straight board for "cut and fill"; curved, boxed-end board for excavators; angle board (to left or right) for gradebuilding.

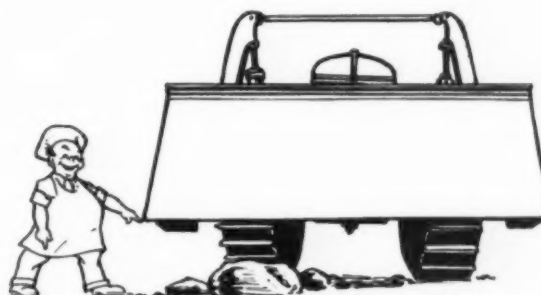
★ Complete Line — 7 bulldozer models with corresponding gradebuilder and excavator moldboards for gasoline and diesel tractors of any horsepower. See them at work on every type of construction project in Bulletin 834.

**The Baker Mfg. Co.**  
568 Stanford Ave., Springfield, Illinois



### Greater Down Pressure!

Full weight of tractor front end can be exerted on moldboard. No "linkage" losses—direct lift and down pressure.



### Moldboard Level on Rough Ground!

Exclusive connected twin cylinders equalize pressure, keep moldboard level on rough ground—no by-passing material on one side of blade.

# BAKER

*The Modern Tractor Equipment Line*  
for **EARTH MOVING**  
**LEVELING AND GRADE BUILDING**  
**SNOW REMOVAL**  
**ROAD MAINTENANCE**

# PEAK PERFORMANCE



ROAD BUILDING WITH A MODEL #315 DIESEL COMPRESSOR AT 5,000 FT. ALTITUDE

## ... WHEN USING THE MODERN SCHRAMM COMPRESSOR

... OPERATES just as efficiently at HIGH ALTITUDES as at SEA LEVEL, and under the most extreme weather conditions.

A report from northern Minnesota reads "The Japs would be easy picking here tonight—about 25° below zero with northwest wind. All SCHRAMMS are starting same as usual. No one but Norwegians, Swedes and Eskimos, however, are tough enough to stay out with them."

OWN A SCHRAMM . . . CUT COSTS . . . STURDY . . . RUGGED . . .  
COMPACT Construction without excessive weight . . . SAVES TIME . . . SAVES MONEY.

PERFORMANCE Records in every field are evidence of their high Quality and the years of experience behind them.

A Complete assortment of compressors available for Defense Work . . .

- |                                |                          |
|--------------------------------|--------------------------|
| • Air Raid Sirens              | • Plant Maintenance      |
| • Construction                 | • Power Plant Stand-By   |
| • Demolition                   | • Power-Take-Off         |
| • Engine-Drive for Fire Alarms | • Rescue and Fire Truck  |
| • Engine-Drive Stand-By        | • Self-Propelled Crawler |
| • Fire Sirens                  | • Universal Service      |
| • Municipal Emergencies        | • Utility Emergencies    |

Built in sizes from 20 to 420 cubic feet actual air delivered.

Either Gasoline or Diesel Engine Drive

Write for Catalog 42-P

**SCHRAMM, INC.** WEST CHESTER, PA.  
DEALERS IN PRINCIPAL CITIES

(Continued from page 116)

moisture content of the soil had to be within 3 percent of 90 percent optimum, and the compacted density was required to be at least 90 percent of maximum.

After the earth grade ahead of the form setters had been bladed by a Caterpillar auto patrol, a Carr formgrader cut shallow trenches to line and grade for the forms. Specially built 8x9-in. Blaw-Knox forms which could be turned on either side for 8- or 9-in. slab served on this job to form the 9-in. edges of the pavement. Loose earth under the base of the forms was compacted with a Jaeger mechanical form-tamper.

With the forms set to line and grade, subgrade for the pavement slab between them was trimmed to cross-section profile by a tractor-drawn Carr finegrader mounted on steel wheels which rode on the top flanges of the forms. As a final check on subgrade, the 34E paver, which operated inside the forms, pushed a Carr subgrade strikeoff and pulled a contractor-built planer.

### Paving Operations

Two workmen assembled expansion joints in a special jig and transported complete assemblies with detachable steel plow-handle carriers which were temporarily attached to the two ends of each assembled joint. The steel carriers were equipped with flanged brackets which fitted over the tops of the forms, holding the joint in proper position on the subgrade until stakes could be driven to support the assembly. Other workmen placed corner bars, tiebars, prefabricated contraction joint assemblies and wire mesh for the two lanes of 22-ft. slab. Two puddlers took care of the hand shoveling of concrete.

A winch-controlled strikeoff operated by the paver leveled the first course of concrete 2 in. below finished grade for placement of the mesh reinforcement. Solid wooden arches placed on the forms at each expansion joint carried the strikeoff over the joints. The top course of concrete was struck off and finished by a Jaeger-Lake-wood two-screed finishing machine.

Back of the finishing machine came a rolling steel-frame unit for cutting and installing the center-line joint. This machine, equipped with a disk wheel for cutting the joint slot, was pushed in front of a self-propelled Koehring longitudinal float which smoothed any irregularities in the surface of the pavement.

Following this operation, the surface was finished by hand with straightedges, floats and belts. After the joints had been edged, the surface of the pavement was sealed immediately for curing by an impervious coating of Hunt process membrane sprayed on the slab. When first applied, the coating had a faint pink color which rapidly faded out to leave a clear, colorless membrane.

### Batching Plant

Near the center of the job the contractor set up a batching plant on a nearby railroad siding. A Koehring crane powered

(Continued on page 120)



# Answering America's need for more and more Airports



## DAY and NIGHT shifts at work on Asphalt runways for the Daytona Beach Airport

Approximately 65,000 tons of Asphaltic Concrete were laid by the Frank Construction Company of Daytona Beach, Fla., on runways of the Daytona Beach Airport.

The new 4-runway airport at Daytona Beach, Fla., is an example of the use of Asphalt construction for both base and wearing surface. Runways of this important airport are covered by a 5-inch thickness of resilient Asphalt construction, consisting of a 3½ inch base and 1½ inch surface.

The hot plant-mix type of Asphalt runway used at Daytona Beach stands up successfully under the impact of heavy commercial or military planes. It presents a smooth, but highly skid-resistant surface. Damage to *all-asphalt* runways caused by bombs is quickly and easily repaired. This is especially important today.

TEXACO Asphalt was used in constructing the greater part of the quarter-million square yards of runways which serve the Daytona Beach Airport.

# TEXACO



# ASPHALT

THE TEXAS COMPANY, Asphalt Sales Dept., 135 E. 42nd St., New York City

BOSTON

PHILADELPHIA

RICHMOND

CHICAGO

JACKSONVILLE

HOUSTON



## OWEN-EQUIPPED *Mobile units*

### BOOST GRAVEL PLANT EFFICIENCY

WHETHER it's shuttling up the track to the pile for a capacity grab of dry gravel, or just a matter of swinging the boom and dropping that OWEN into the water pit for a mouthful of dripping aggregate,—one thing is certain; for greatest daily output with minimum operating cost "OWENIZED" mobile units are requisite.

**The OWEN BUCKET Co.**

6020 BREAKWATER AVE., CLEVELAND, OHIO

BRANCHES: New York, Philadelphia, Chicago, Berkeley, Cal.



## Simplex Jacks for Safety

They prevent sprained backs, ruptures and accidents on the scores of lifting, lowering, pushing and supporting jobs that come up daily on every construction project.

Check These Simplex *Plus* Safety Features:

Every Simplex Lever Jack is guaranteed to lift its full rated capacity on cap or toe lift. Pawls have greater contact area with rack bar. Unbreakable trunnions—no fulcrum pins. Expansion rivets—no machine screws to come loose. 5 to 35-ton capacities.

Simplex Screw Jacks have tough malleable bases, self-leveling cap with 9° float, a single large chrome-moly steel ball that reduces friction 88%, safety peephole in base. Will not twist out from under load.

Simplex Hydraulic Jacks have non-deteriorating Neoprene packing seals, pressure-tested malleable iron base and top nut, release valve shielded against breakage.

*All Simplex Jacks are carefully inspected and tested.*

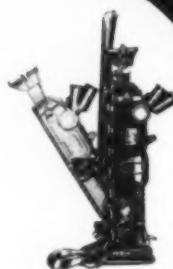
Sold by leading supply houses.

**Templeton, Kenly & Co., Chicago, Ill.**

*Better, Safer Construction Jacks Since 1899*

### Simplex Jacks

A better Jack for every job -  
many jobs for every Jack



(Continued from page 118)

by a Caterpillar D 13000 diesel engine handled a Blaw-Knox 2-yd. clamshell bucket on a 50-ft. boom to unload sand-gravel aggregate from gondola cars to stockpiles and to charge the bins of a 40-ton Johnson batching unit from the stockpiles. The crane also shifted lines of loaded and empty cars on the siding.

Bulk cement was unloaded into an undertrack hopper and was carried by a belt conveyor about 60 ft. long to the elevator of a Johnson Dutch-mill-type 100-bbl. plant. A compressor supplied air for agitating cement in the bin of the plant and in the hopper-bottom cars.

Ford trucks equipped with St. Paul dump bodies and with Ford or Eaton two-speed rear axles transported two batches per trip from the plant to the pavers. Two of the 1,385-cu.yd. batches for the 34E mixer exceeded 5 tons in weight. Fourteen batch trucks were kept on the job. On a 2-mi. haul, nine trucks ordinarily sufficed to supply the big mixer.

### Water Supply

To furnish water through 3½-in. O.D. pipe for distances up to 5 mi., the contractor used two triplex pumps, a Gorman-Rupp and a Worthington, set up side by side to deliver separate streams into one line. The pumps took water from a tank which was filled from a city hydrant. To save water, the inflow from the hydrant was regulated by a float valve salvaged from an old concrete mixer and placed in the tank. Pressure in the 3½-in. line of the pumping station was maintained at 175-215 lb. Above 215-lb. pressure, water was returned to the tank through relief lines.

### Stabilized Shoulders

Outer edges of the divided roadway are to be flanked with shoulders 10 ft. wide surfaced with bituminous seal and armor coat on a bituminous-primed 6-in. compacted base of stabilized material made up of gravel, sand-gravel, sand and soil binder. Because of the bad weather last fall, this work was held over until spring, and temporary earth shoulders are serving meanwhile.

### Supervision

Wardner G. Scott is state engineer and M. B. Jones is chief highway engineer of the Nebraska Department of Roads and Irrigation, which built the Omaha-Fort Crook highway improvement. Lee Odman, senior engineer, was in charge of the project for the state.

Principal officers of the two firms in the contracting combination which constructed the \$575,000 job are Hubert Everist, president of the Western Contracting Corp., Sioux City, Iowa, and Peter Kiewit, Jr., president of Peter Kiewit Sons' Co., Omaha. Paving operations were directed by Harry Woods, superintendent, Western Contracting Corp., and grading work was supervised by Ben Williams, superintendent, and T. C. Powell, foreman, Peter Kiewit Sons' Co.

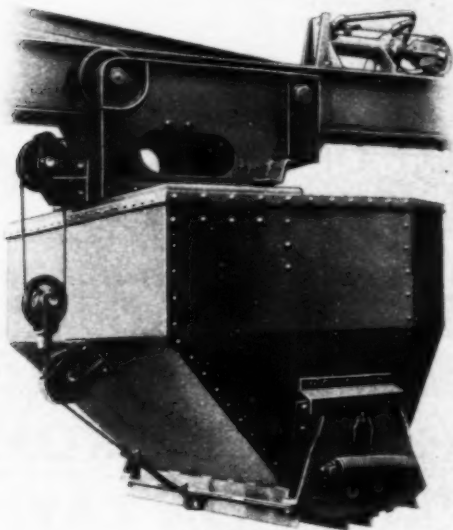


*"the greatest advancement since the advent of the Dual Drum"*

# The New *Ransome* Hydraulically Controlled Boom Bucket



Ransome 34-E Dual Drum Paver with Hydraulically Controlled Boom Bucket, at work on a large eastern airport.



Pat. Appl. for

The Only Hydraulically



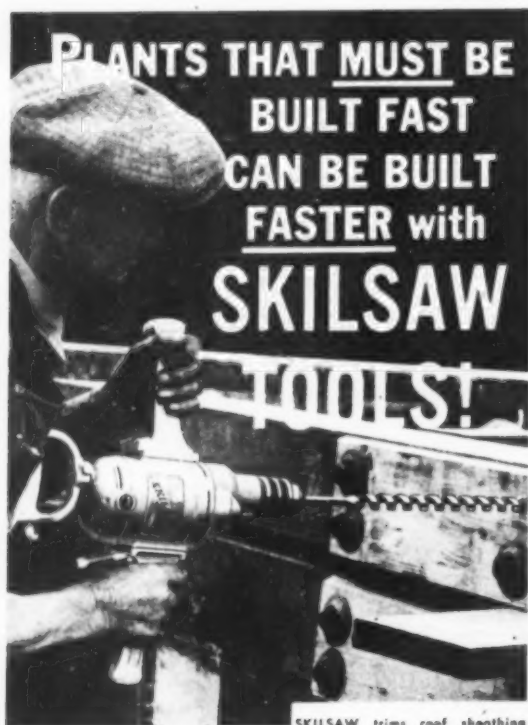
Controlled Paver

LOOK over these advantages made possible by the new Hydraulically Controlled Boom Bucket — available only with Ransome 34-E Single and Dual Drum Pavers.

1. Eliminates split batches.
2. Can discharge small portions of concrete, close doors and move boom to other locations.
3. Saves time of bucket travel for split batches.
4. Doors open or close to any degree at any position on the boom.
5. High clearance to clear strike-off.
6. No mechanism in carriage to wear and get out of order.
7. No inside or outside levers, arms, etc., are used.
8. Positively no leakage through doors.
9. Large unobstructed opening permits quick discharge of dry concrete.
10. Less wear on the boom bucket cables. Operator does not have to throw boom bucket clutch in reverse to trip the bucket.
11. Less wear on boom bucket clutches. Not necessary to clutch for tripping the bucket to discharge concrete.

These are only a few of many advantages. Bulletin No. 195 tells the complete story. Write for copy.

**RANSOME** CONCRETE MACHINERY COMPANY  
Dunellen New Jersey

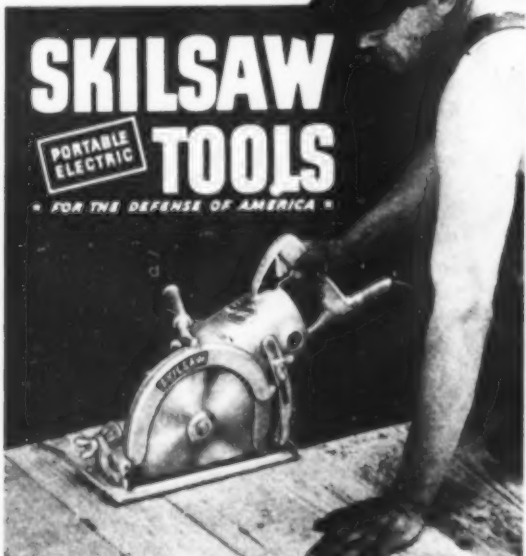


New plants, enlarged plants, remodeled plants—they're needed **FAST** for America's victory—they're finished faster when SKILSAW TOOLS are on the job, speeding up building each hour of each day. Are skilled hands scarcer? One hand with SKILSAW does the work of ten! Is time too short? SKILSAWS cut days from schedules... SKILSAW DRILLS punch holes in bottlenecks! Do you want proof? 9 out of every 10 defense contractors use SKILSAW TOOLS.

9 powerful SKILSAW Models to speed up every sawing job in new construction or remodeling. 22 SKILSAW DRILLS do all drilling faster... from smallest lead-holes for hardware and fixtures to heaviest boring in timbers. Ask for a demonstration.

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SKILSAW trims roof sheathing faster... after it is nailed in place to save extra time.



SKILSAW DRILL speeds up timber boring. Powerful, yet compact for drilling in close quarters.



SKILSAW quickly cuts plywood panels... speeds up concrete form work... makes pocket cuts swiftly.



## More Work FROM Tractor Power

(Continued from page 53)

of the time in maintaining haul roads, clearing, pioneering, side-hill cuts, pushing, and other duties. The cost can be prorated accordingly.

**Tandem Hook-Up**—When new equipment cannot be purchased and larger production is required, present tractor equipment can be used with a tandem hook-up. In this way, yardages can be substantially increased (Fig. 6) without a corresponding increase in the cost per yard. Use of a tandem hook-up, as well as other scraper applications, is economical only to the point where the net cost per yard is equal to or less than that obtained with other scraper combinations or competitive methods.

**Loading Downhill**—Loading downhill is equivalent to adding tractor drawbar pull, as gravity works in favor of the machine. This method of loading gives capacity loads when using old tractors with less drawbar. When the favorable grade is more than enough to fill the scraper, a shorter loading time is realized.

Figs. 7 and 8 illustrate the principle of downhill loading. To the engineer it is a simple problem in mechanics, and it can readily be understood by any earthmoving contractor.

On a level grade, Fig. 7, force W (weight of scraper) is detrimental to the loading action, and the tractor is required to overcome the resistance created by this force, as well as the resistance encountered in actual cutting, digging, and rolling. In Fig. 8, force W is broken into its two component forces, P. and S. Force P is the detrimental force under these conditions, while force S helps in the loading action. Mathematically, force S increases with the angle O which equals the angle A, thus shortening loading distance and increasing load quantity.

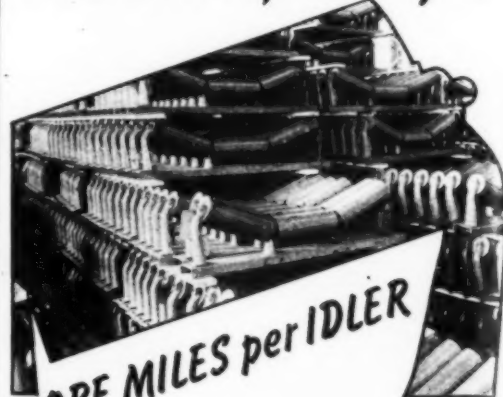
Fig. 9 illustrates the proper method of maintaining downhill loading, while Fig. 10 shows how the advantage of downhill loading is sacrificed. Fig. 11 is a chart showing yards gained by loading downhill.

#### Grades and Roadway Rolling Resistance

Grades and roadway rolling resistance are two important factors that affect earthmoving efficiency. Excessive grades require greater drawbar pull, a lower gear and a corresponding reduction in haul speed. If roadways are kept in good shape and grades are cut down as low as possible, power goes farther. In many cases, the use of a motor grader to maintain haul roads has proved highly profitable. Rolling resistance can offset grade considerations, or it may be additive and re-

(Continued on page 124)

## ROBINS Gives You



Robins uses the best materials and doesn't skimp on quality of workmanship. Robins Triple Grease Seals keep grease in and dust out. Pulley assemblies are identical, interchangeable, reversible. "One-Shot" lubrication fills all bearing chambers from either side—no dangerous reaching under the belt or loose grease pipes.

ROBINS CONVEYING BELT COMPANY  
PASSAIC, NEW JERSEY



## An Asphalt STOCK PILE

★  
**STAYS PLIABLE  
ALL WINTER—  
SETS PROMPTLY  
ON LAYING**

★  
AVAILABLE FOR INSTANT USE  
ON ANY ROAD, AIRPORT, OR  
PAVED SURFACE, REGARDLESS  
OF WEATHER.

WHEN MEN CAN WORK,  
KOTAL WILL WORK.

## KOTAL COMPANY

52 Vanderbilt Avenue  
NEW YORK, N. Y.





## ***On the job—For America***



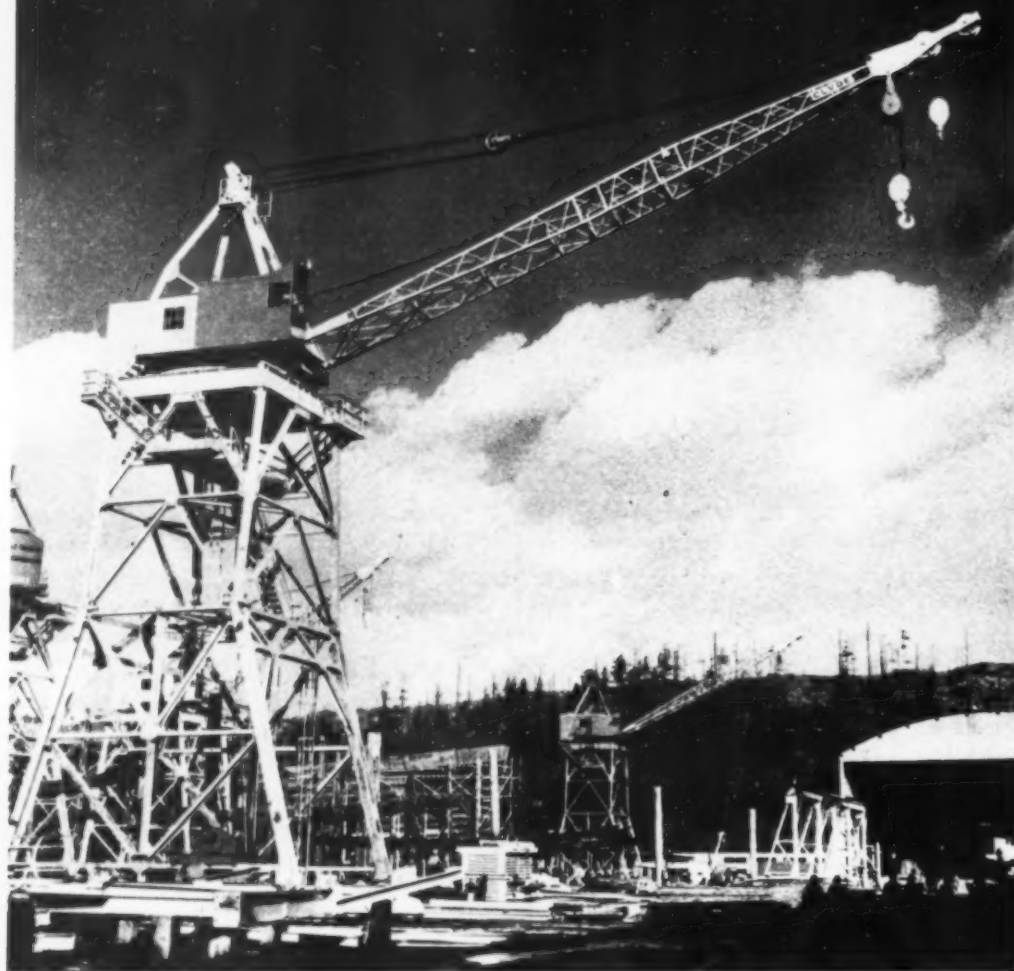
**This large Jaeger Concrete Spreader manufactured by the Jaeger Machine Company, Columbus, Ohio, speedily building runways on an important bombing field job.**

**Ferry and Pearson, Los Angeles contractors, are operating the equipment. A Continental Red Seal Power Unit PM271 is supplying the power.**

**On countless jobs throughout America, Continental Red Seal Engines are at work — supplying horsepower to save manpower.**

***Continental Motors Corporation***  
**MUSKEGON, MICHIGAN**

# CLYDE WHIRLEYS



## ON THE LARGEST CONSTRUCTION JOB IN HISTORY!

Scientifically engineered Clyde Whirleys keep pace with the fast moving schedule of America's huge building program . . . ships, dams, locks and bridges. Every piece that goes into these long reaching, fast moving, versatile machines has been carefully and accurately designed for its particular duty to assure the utmost in safety and efficiency.

Seven standard sizes with lifting capacities up to 140,000 lbs. at a 35 foot boom radius and 22,000 lbs. at 150 feet. Powered by Diesel, electric, steam, gasoline or Diesel-electric.

## CLYDE IRON WORKS, INC.

DULUTH, MINN.

HOISTS • WHIRLEYS • CARPULLERS • DERRICKS • DECK MACHINERY

(Continued from page 122)

quire an even greater amount of drawbar. The following formula can be used to calculate grade ability in conjunction with roadway rolling resistance:

$$GA = \left( \frac{TE}{GVW} - \frac{U}{T} \right) \times 100, \text{ in which}$$

GA = Grade ability in percent  
 TE = Tractive effort or drawbar pull in pounds  
 GVW = Gross vehicle weight in pounds  
 U = Selected rolling resistance in pounds  
 T = 2,000 lb. (1 ton)

Table of  
Typical Rolling Resistances (U)

Hard-packed smooth road, no penetration . . .	40 lb.
Good construction road, well maintained . . .	65 lb.
Average construction roadway . . . . .	100 lb.
Moist sand . . . . .	200 lb.
Dry sand . . . . .	300 lb.

For example:

Tractor weight	=	34,000 lb.
Scraper weight	=	30,000 lb.
Dirt weight	=	36,000 lb.
Gross vehicle weight (GVW)	=	100,000 lb.
U	=	40 lb.
TE	=	26,000 lb. in first gear at 1.6 m.p.h.

Then,

$$GA = \left( \frac{26,000}{100,000} - \frac{40}{2,000} \right) \times 100$$

$$= (.26 - .02) \times 100$$

$$= 24 \text{ per cent}$$

Hence, a 34,000-lb. tractor in first gear at 1.6 m.p.h. can pull a trailed load of 66,000 lb. up a 24 per cent grade on a hard-packed, smooth road.

Scraper weights and capacities, as well as drawbar pull and speed, can be obtained from specification sheets for use in determining any specific haul problem. By transposing the formula and working backwards, it is possible to obtain necessary drawbar and speed.

Taking the problem already stated as an example, with the same information given except for drawbar, how would one determine the gear, drawbar and speed? Solution:

$$GA = \left( \frac{TE}{GVW} - \frac{U}{T} \right) \times 100$$

$$TE = \left( \frac{GA}{100} + \frac{U}{T} \right) \times GVW$$

$$= \left( \frac{24}{100} + \frac{40}{2,000} \right) \times 100,000$$

$$= (.24 + .02) \times 100,000$$

$$= 26,000 \text{ lb. drawbar}$$

With the required drawbar thus determined, the next step is to go to the specification sheet for the tractor to be used and find: (1) What gear provides the required drawbar and (2) what is the speed for this gear. If the drawbar falls between two gears, the lower gear must be used. As a practical illustration, it may be found that the tractor to be used has only 25,000 lb. drawbar. In this case it will be necessary either to carry smaller pay loads or to cut down the grade.

As another example, the tractor may lack just a few pounds of the drawbar necessary for running in highest gear, and as a result it may have to travel in fifth gear at 3.6 m.p.h. instead of sixth gear

(Continued on page 126)





***TOUGH AS A BULLDOG...***

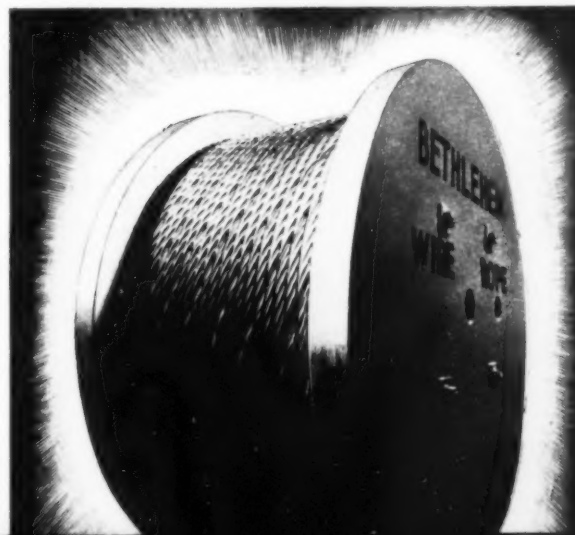


***supple as a whippet***

Two unusual qualities are combined in Purple Strand Form-Set wire rope: rugged toughness and pliant ease.

Purple Strand is made of the toughest steel used in wire rope—Improved Plow. Then this tough rope is preformed (every strand permanently shaped into its helical position as the rope is being made). As a result, Purple Strand Form-Set is relaxed, easy to handle. Broken wires won't wicker. No seizing is necessary when the rope is cut or spliced. Fatigue-resistance is improved. Purple Strand Form-Set is our top-notch rope. Try it.

**PURPLE STRAND  
FORM-SET  
WIRE ROPE**



**BETHLEHEM STEEL COMPANY**

# WE CAN Show You How to LOWER CONCRETE COSTS

On Your Job

★ ★ ★

The Universal Form Clamp Co. is constantly advising means of effecting appreciable savings

to the ARMY  
to the NAVY  
to the CONTRACTOR

by the use of the correct reinforcing steel accessories which save time, labor and material on their jobs.

★ ★ ★

Universal points with pride to the letters we have received commenting favorably on the part we are playing in the speed and economy of the defense program.

★ ★ ★

Let our engineers help you solve your reinforcing steel accessory problem to build for victory

**QUICKER  
CHEAPER  
BETTER**

And when you have chosen the best

**WE CAN  
DELIVER THE GOODS  
ON TIME**

Complete Line of Concrete Form and Reinforcing Accessories

**UNIVERSAL  
FORM CLAMP CO.**

Main Office: CHICAGO

Branches and Distributors in All  
Principal Cities

Write for Catalog Today

(Continued from page 124)

at 4.9 m.p.h. If the yardage warrants, it may be profitable to cut down the grade to permit traveling in sixth gear. Cycle time could be reduced, or additional distance could be traveled.

## Pusher Efficiency

It is well known that pusher tractors are a necessity with the larger size scrapers. When pusher loading is necessary, the pusher tractor should be used effectively. Time consumed in non-productive waiting is lost time and lost money. This loss can be minimized in two ways:

(1) By synchronizing the pusher and scrapers to eliminate waiting time.

(2) By step-pushing and loading in both directions when the borrow pit allows.

Accompanying diagrams, Figs. 12 and 13, illustrate this method.

Fig. 12 shows the conventional pusher loading procedure. After each loading period, the pusher returns to the point of beginning. This return trip results in lost time and greater pusher costs.

On the other hand, Fig. 13 shows the step-push method. By this procedure, both pusher distance and pusher time are saved. Often the field conditions will not lend themselves to the ideal operation, but modification can be made to fit the job.

A recent report reveals the increase in pusher efficiency to be gained by using the step-push method, exactly as shown in Fig. 13. The results are indicated in the following table giving comparative figures for scraper cycles and for production yardage by step-push and conventional methods.

Comparison of  
Pusher Loading Methods

	Step-Push Method	Conventional Method
Fixed Time—		
Average load time, min. ....	1.0	1.50
Average spread time, min. ....	0.5	0.5
Average time for acceleration and turns, min. ....	1.0	1.0
Total Fixed Time, min. ....	2.5	3.0
Haul Time, min. ....	1.5	1.5
Total Cycle Time, min. ....	4.0	4.5
Pay Yards per Load ....	8.0	8.0
Average Loads per Unit ....	15	13.3
Pay Yards per Hour per Unit ..	120	107

By the step-push method, the pusher can serve four units, as compared with only three units when operating in accordance with the conventional method. Assuming pusher ownership and operating cost at \$4.50 per hour and earthmover ownership and operating cost at \$5 per hour, the unit costs per yard become

$$\frac{\$5 + \$1.13 \left( \frac{1}{4} \text{ pusher cost} \right)}{120} = \frac{\$6.13}{120} = 5.10\text{c. per yard,}$$

$$\text{and } \frac{\$5 + \$1.50 \left( \frac{1}{3} \text{ pusher cost} \right)}{107} = \frac{\$6.50}{107} = 6.10\text{c. per yard,}$$

and the saving amounts to  $6.10 - 5.10 = 1.0\text{c. per yard.}$

As the total yardage reported for the job was 600,000 yd., a unit saving of 1 c. per yard meant a total saving of \$6,000.

Recommendations offered in the foregoing paragraphs refer not only to tractor-

drawn scrapers, but also to the newer and more modern rubber-tired, self-propelled earthmovers. These earthmovers depend upon good haul roads, easy grades and curves, traffic regulation, and low rolling resistance in conjunction with the other factors, although they work in worse-than-average conditions better than conventional trucks.

★ ★ ★

## Roads to Victory

(Continued from page 44)

marching feet. More than half a million men and tens of thousands of vehicles took part in the maneuvers. The roads stood up under them all!

Army reports on the maneuvers show that the network of roads throughout the "zones of action" was generally adequate for movement of troops and supplies. Their construction was so good, in fact, that very little maintenance or repair work was necessary. Since the roads were usually built on sandy soil, even the meager rain had little effect. As a matter of fact, the roads were so good and the rain so slight that the Engineers complained bitterly because they did not have enough repair work to do.

## Lessons Learned

The lessons derived from the maneuvers were these: Concrete roads do not suffer much from the pounding of military traffic. While there is some breakage, it is easily reparable. Oiled and macadamized roads do not stand up as well and require heavier repairs. Tanks and other treaded vehicles tend to pick up and tear to pieces the patched parts of these roads. They "squeeze" the softer parts of the oiled surface roads into chuck holes. Although some secondary earth and gravel roads get badly cut up by military vehicles, the Engineers are generally able to keep them in good shape by dragging or grading.

When the score-card on the maneuvers was finally added up, it showed that most road repairs consisted solely of surfacing, ditching and grading. If the roads in all 48 of our states can stand up to military use as well as did those in the maneuver areas, the Engineers would be highly pleased.

Dust conditions were extremely bad during the maneuvers in Louisiana. Some roads were found to be 6 in. deep in a fine, powdery dust. Conditions were so bad that soldiers riding in convoys often had to wear dust masks, and trucks had to run with headlights at noon. Because of a shortage of sources in Louisi-

(Continued on page 128)



...and now  
**CHEVROLET**  
announces a great nationwide



“

**Truck**

**CONSERVATION  
PLAN”**

To help keep America's trucks  
serving America for the duration

*Conserve TIRES*  
*Conserve GAS*  
*Conserve OIL*  
*Conserve ENGINE*  
*Conserve TRANSMISSION*  
*Conserve COOLING SYSTEM*  
*Conserve BRAKES*  
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PART*

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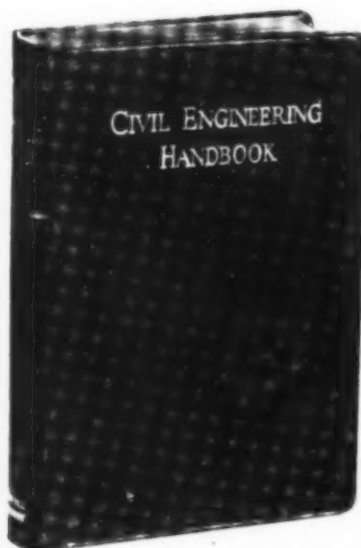
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| —Railway turnouts, connecting tracks and crossings    | —Lateral forces on bridge trusses     | —Mechanics of soil resistance                  |
| —Widening, spiraling and banking of highway pavements | —Arches                               | —Caissons                                      |
| —Highway administration and finance                   | —Slope-deflection                     | —Underpinning                                  |
| —Highway materials and tests                          | —Moment distribution                  | —Sewerage and Sewage Disposal                  |
| —Construction costs of roads and pavements            | —Riveting and welding                 | —Intakes and dams                              |
| Mechanics of Materials                                | —Bearing plates and grillage beams    | —Ground water                                  |
| —Fluid pressure                                       | —Bridges                              | —Aqueducts and pipe lines                      |
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(Continued from page 126)

ana, it was impossible to settle the roads with gravel. The Engineers were able, however, to alleviate conditions around critical points in back areas by the sprinkling of calcium chloride.

### Rules for Engineers' Guidance

Here are a few of the rules that guide the Corps of Engineers:

*Do not build a good new road when an existing one can be reconditioned.*

*Do not try to maintain too many roads. A few good ones between vital points and the front are far better than many poor ones aimlessly located all over the area.*

*Steady maintenance of these roads during periods of use will save many a day of work later. As soon as repairs are needed, make them. Economize on time, labor and materials.*

*For repair work, use local materials whenever possible, and in the field keep up a constant search for them. Locate stockpiles of necessary materials at intervals along roads for use in future repairs.*

The Engineers follow four points in road maintenance: The first, of course, is that drainage is most vital. "Get the water off and the rock on," goes the old saying.

After drainage comes the need for a firm, dry foundation to carry the load.

Then there must be "homogeneous, well-knit base and intermediate courses of well-graded materials," thoroughly compacted to distribute the load to the foundation.

Finally, there must be a top or wearing course which can resist the abrasive action of intense military traffic, and which, at the same time, can shed water to the ditches alongside.

### Army Uses Mechanical Equipment

Machines work faster than men, the Army realizes, and so the Engineers are instructed to make the maximum use of road machinery and equipment, both in construction and maintenance.

From an organization standpoint, the Engineers invariably strive for decentralization of responsibility. That, they know, is essential to good road maintenance. Each man and each unit are made responsible for all work within the area assigned to them.

Final responsibility for road maintenance and repair work in any area lies with the ranking officer assigned to the Army unit stationed there. At all times he must have on hand full information as to the capacity and condition of the road network in his zone. For repair work, he must be familiar with the availability of equipment, materials, transportation facilities and additional labor.

For work on the roads during normal times, the Unit Engineer can call on any Engineer troops assigned to him. All of them are trained in road building. In

(Continued on page 130)





#### BEST ON A WIDE VARIETY OF JOBS

"During the many years I have owned A-W BADGERS, I have excavated a number of railroad subways between pile bents where full revolving shovels could not have been used . . . excavated narrow alleys just barely wide enough to take the crawler tread on the machine . . . erected structural steel beams for bridge floors that were much heavier than could be handled by any other type of machine. In fact, the A-W BADGER is the most versatile and most satisfactory machine I have ever owned."

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### WHERE NO OTHER SHOVEL COULD GO

● Because the half-yard BADGER swings less dead weight to move more dirt, it rivals larger shovels in output capacity. An exceptionally low center of gravity and a single line pull on the hoist drum of 10,000 lbs., together with a positive, powerful chain crowd give the BADGER the power and stability to handle any diggable material with maximum speed.

This rugged, big capacity, fast-moving shovel is exceptionally economical to operate because it wastes no fuel or power swinging unproductive weight. It performs with equal efficiency as a shovel, dragline, trench hoe, pile driver or skimmer. Investigate its record of efficiency and economy on a wide variety of jobs.

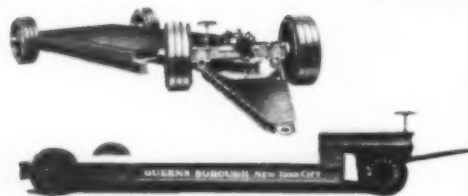
THE AUSTIN-WESTERN ROAD MACHINERY CO., Aurora, Illinois



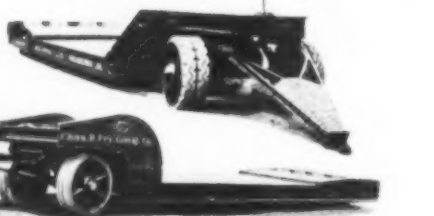
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WITH THIS MECHANIZED  
ERA...**



The first Rogers Trailer, developed especially for the quick movement of heavy machinery. It was a pioneering achievement in its day but was crude in relation to later models, as will be noted.



The next Rogers Trailer developed, with drop frame construction and front dolly pivoted to turn at right angles to afford greater ease of handling and safer control.

**ROGERS  
HEAVY DUTY  
TRAILERS**



Next came the above model. Note the drop frame connected to the gooseneck by means of diagonally braced heavy plates, also the open top rear deck, housing four wheels on two rocking axles.

This model established a new low in height of deck and rear bridge. It permitted easier loading and gave greater stability and lower headroom clearance for loads. It also was the first unit to embody the strong, symmetrical "gooseneck" which has since been a characteristic feature of Rogers Trailers.

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PERFORMANCE  
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CRUSHERS, PULVERIZERS, COMPLETE PLANTS, SPREADEROLLERS, PORTABLE ASPHALT PLANTS

(Continued from page 128)

time of action, however, combat Engineers at the front are far too occupied with such vital duties as building ponton bridges and tank barricades, for instance, to do much road work. They usually do only the minimum road work required to permit the advance of fighting troops and leave the rest to the Engineer Corps Combat Regiments, Separate Battalions and General Service Regiments (which should not be confused with the labor battalions organized by the Quartermaster Corps).

These General Service Regiments are able to fix up roads as soon as the fighting moves forward. To do the job, they carry with them five pieces of basic equipment: air compressor; dump truck; power shovel; motorized road grader; and medium tractor, with angledozzer.

In addition, 26 pieces of special road equipment also are available. These are tabulated herewith:

### Equipment Carried by General Service Regiments

- Crushing and screening plant
- Cultivators, field, Chisel
- Drags, brush, bituminous
- Distributors, bituminous
- Distributors, water
- Graders, drawn
- Harrows, disk
- Heater, tank car, bituminous
- Mixer, bituminous
- Mixer, pugmill, mobile
- Mixer, rotary, tiller-type
- Pumps, bituminous, mobile
- Pumps, water, loading
- Ripper, road
- Rollers, steel surfaced-pull-type
- Roller, steel surfaced, self-propelled
- Rollers, sheepfoot
- Scrapers, carrying
- Spreaders, aggregate, mechanical
- Sweepers, rotary
- Tanks, bituminous supply
- Tank, water supply
- Tractors, crawler-min. 75 drawbar hp.
- Tractors, pneumatic tires
- Tractors, truck
- Trailers, semi-

During the maneuvers it was found that at times too many angledozers had been assigned to combat outfits, with the result that they tied up road traffic. As a rule, however, they proved almost indispensable. They were used extensively, especially in the construction of approaches to fords.

The air compressor was extremely useful. Portable gasoline tools are issued to supplement the air compressor, particularly where it is found necessary to bypass a column for effecting repairs or removing obstacles.

### Traffic Control Important

Fine construction equipment and well-planned highways can be of no value to an Army unless the traffic is scientifically directed. The jamming-up of convoys is an outright gift of a target to an enemy. To minimize traffic delays, the Corps of Engineers is training organizations in traffic engineering problems. The numerous functions of traffic control operation make it necessary that skilled traffic control personnel be available at all times. Unless a motorized Army is so controlled

(Continued on page 132)



# HAZARD LAY-SET Preformed is *Preformed*

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**MODERN  
WIRE ROPE  
DIGEST**

## PREFORMED Rope Bends More Easily

Much of the lack of resistance to bending fatigue in a non-preformed wire rope of any grade is due to the unresolved stresses introduced during the fabrication of wires into a rope—stresses that so react that they prevent the attainment of maximum resistance to bending fatigue. If wires are relieved of the tendency to fly away from the rope, the only factor determining resistance to bending fatigue is the natural resistance to bending, resident in the wires themselves. A **PREFORMED** rope bends more easily and with less additional stress on the metal. Therefore, a **PREFORMED** wire rope may be bent more often than one that is non-preformed.

Illustrating the strained position of wires in a non-preformed wire rope



Wires in a preformed wire rope lie at ease



PAGE 59

• More and more operators in practically all fields are recognizing the superiority of Hazard **LAY-SET**. They know that **LAY-SET PREFORMED** not only bends easier and thereby lasts longer, but that it handles easier, faster and safer. It resists kinking and whipping; practically refusing to rotate in sheave or drum grooves. For longer life and better service specify Hazard **LAY-SET PREFORMED** Green Strand. The Green Strand identifies the grade of steel as Improved Plow Steel.



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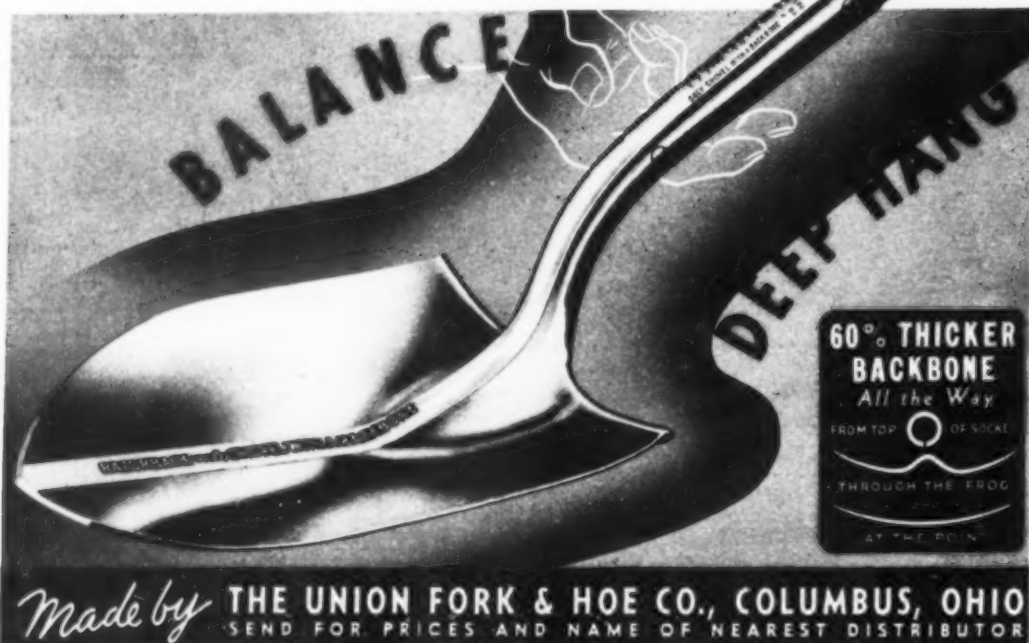
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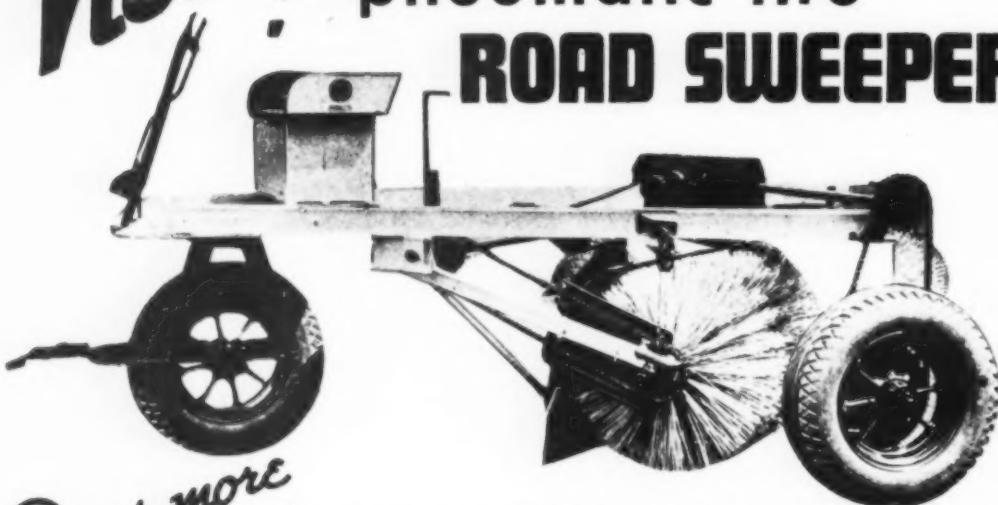
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*Does more  
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3-Wheel Chassis provides balanced, 3-point suspension. An extremely short turning radius, makes unit exceptionally easy to handle and steer. A new method of raising and lowering gives quick, easy positive control of broom. The frame is all steel construction... eliminates a considerable amount of unnecessary weight. The machine is simple, foolproof, durable and costs less to maintain. Send for Catalogs 10 and 28... for complete information about the RELIANCE line of Road Building, Maintenance and Quarry Equipment.

**UNIVERSAL ROAD MACHINERY CO.**

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(Continued from page 130)

that confusion, congestion and delays are eliminated, movement will not be much faster than with foot troops and horse-drawn vehicles. To have a satisfactory traffic control organization there must be constant reconnaissance, sign surveys, immediate dissemination of road information, and contact must be had with the General Staff in the routing of troop movements.

Columnar movements, spaced in terms of time-intervals rather than space-intervals, are being developed, and as a result, traffic bottlenecks are being eliminated. The Engineers understand that the flow of vehicles moving at relatively high speeds up to a traffic bottleneck must never exceed the flow of vehicles which must move at relatively low speeds through the bottleneck.

In order to create the least possible annoyance to civilian traffic, "infiltration" movements have been adopted for moving military columns through civilian communities. Vehicles of different types are intermingled. They are allowed to halt at will and pass each other just as though they were individual vehicles in normal traffic. Originally designed to provide dispersion and deception as a means of protection from air attacks, it has been found that its use in towns gives civilian traffic an even break. Red lights and speed limits are observed, and local police escorts and special traffic arrangements are not required. Individual responsibility is given to each driver, and he carries it well.

### Aids to Traffic

Other developments in recent military traffic engineering have been numerous. For eliminating confusion between close movements at heavily traveled intersections, a portable, welded steel overpass bridge has been designed. It is made up in five bays weighing about 5 tons each, each bay carried by one heavy ponton trailer. With the aid of light cranes about one hour is required to erect the bridge.

Light, slow-flying airplanes, equipped with public address systems, are used to direct traffic movements from the air. Observers in the planes can give voice instructions direct to drivers of vehicles operating on the ground and can also maintain contact with traffic control headquarters and with traffic control stations by two-way radio. There has also been an advance in blackout functions by the use of "glare" camouflage.

Direction of movement by means of signs has been boiled down to fundamental simplicity. It is obvious that civilian traffic signs are not very suitable for military needs in view of the difficulty of procurement and the fact that they cannot be destroyed rapidly. The multilithed cardboard sign has been developed by the Engineers for directional purposes. The multilithed signs can be prepared very easily in the field by the Engineers with the field equipment which they carry along with them for the reproduction of maps. Adequate signs now exist. The Army knows



where it has to go and in what direction it should move.

#### Strategic and Access Roads

Are there enough roads and do they lead to the right places? Military requirements call for two types of roads: "strategic" roads, and "access" roads. In the first category, there is already a network of 80,000 mi. of main or interstate highways, the selection of which has been the subject of continuous study by the War Department in collaboration with the Public Roads Administration and state highway departments. The bulk of this network is already incorporated in the nation's best highways. The principal weakness in the system is in several thousand inferior bridges with low carrying capacity or inadequate widths. Narrow road surfaces with inadequate shoulder widths are another cause of difficulty which results in serious congestion near military camps and stations.

Among access roads, those connecting Army posts and new or enlarged defense plants with nearby cities or main highways, there are many problems. Our military program, with its construction of hundreds of cantonments and of "arsenals of democracy," naturally has led to a demand for more and more access roads. The Public Roads Administration and the Work Projects Administration have helped out considerably in this field, but the needs have not been fully met.

There are certain restrictions on these agencies. Under the Federal Highway Act of 1940, the Public Roads Administration can only finance road construction if the state concerned matches federal funds dollar for dollar. The WPA can help only to the extent of available relief labor and the funds permitted it by Congress for military and naval purposes.

The 1941 Defense Highway Act did, however, authorize the spending of \$150,000,000 for constructing and improving access roads. Of this, about \$125,000,000 has now been budgeted for this purpose, \$95,000,000 for Army roads and \$30,000,000 for the Navy's.

During the last two years, hundreds of miles of vital access roads have been built by states and counties without reimbursement from federal funds. In many other instances, federal-aid funds have been spent along with the states' matching share on such access roads and strategic routes as were a part of the federal-aid systems.

At present approximately \$50,000,000 is tentatively agreed upon for access roads to military camps, airfields and other Army stations. Nearly 200 separate road projects are included. In addition, tentative plans have been made for spending about \$21,000,000 on access roads to defense plants, involving some 85 separate projects. Great emphasis also is being placed on the construction of road strips to serve as emergency landing fields, thus reducing greatly the hazards of military and commercial aviation.

The definite limitation on available federal funds will make it necessary that

(Continued on page 137)

## Gain SPEED with COST Savings IN CONSTRUCTION



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● America, faced with rush construction such as for docks, industrial buildings, or bridges, finds a ready answer in Vulcan Pile Hammers. Used on recent defense construction, Vulcan ability has been a factor in speeding up the work.

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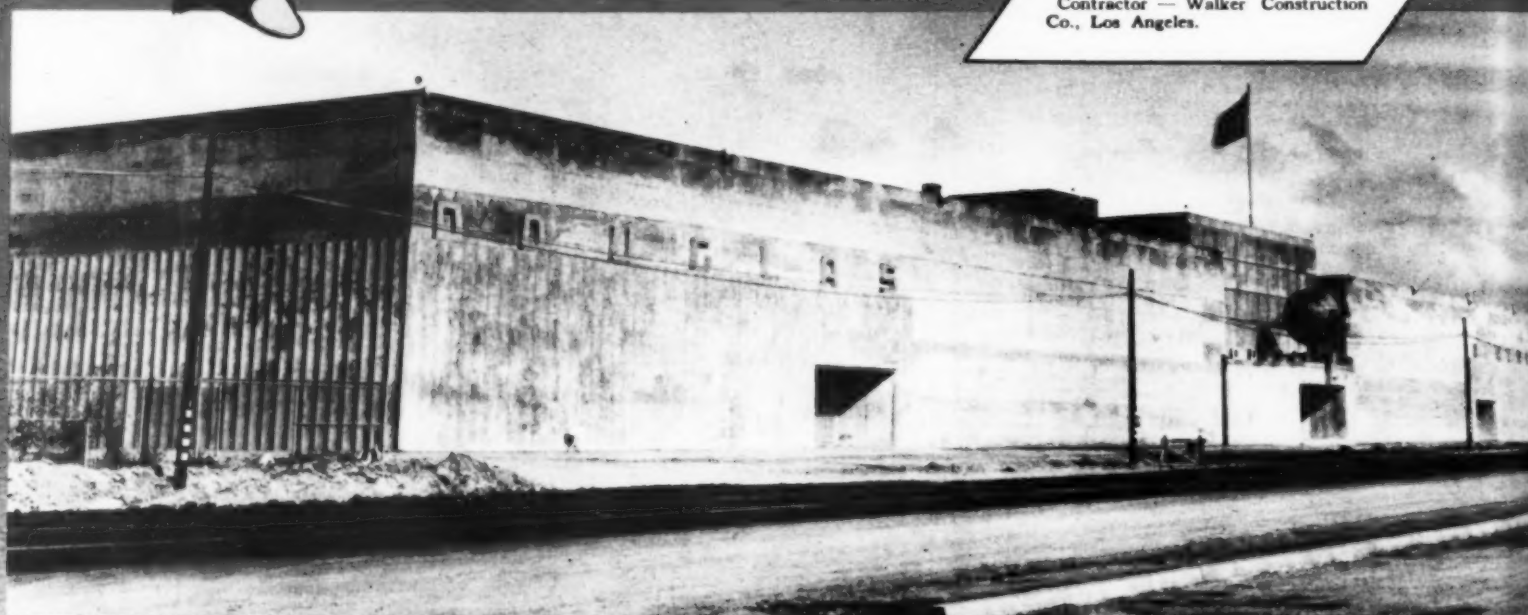
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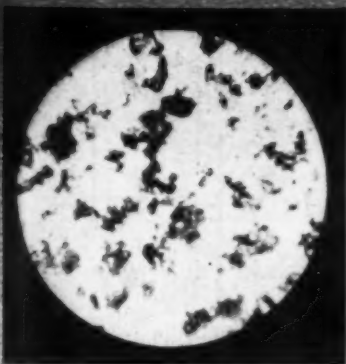
## N IS DELIVERING BOTH.....



### HOW CEMENT DISPERSION WORKS

Only a part of the cementitious value of the cement, whether normal portland or high early, is utilized under usual construction conditions. Investigation shows that with 28 days curing only 50% hydrates. [Anderogy and Hubbell, A. S. T. M. 29 11 554 (1929)].

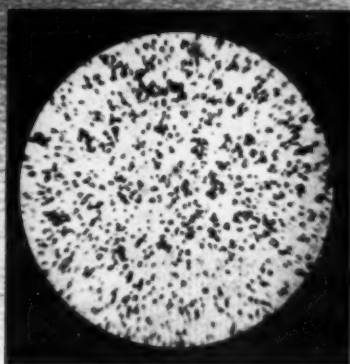
Dispersed cement produces 25% to 40% higher compressive strengths.



Cement suspended in water  
**UNDISPERSED**

#### WITHOUT POZZOLITH

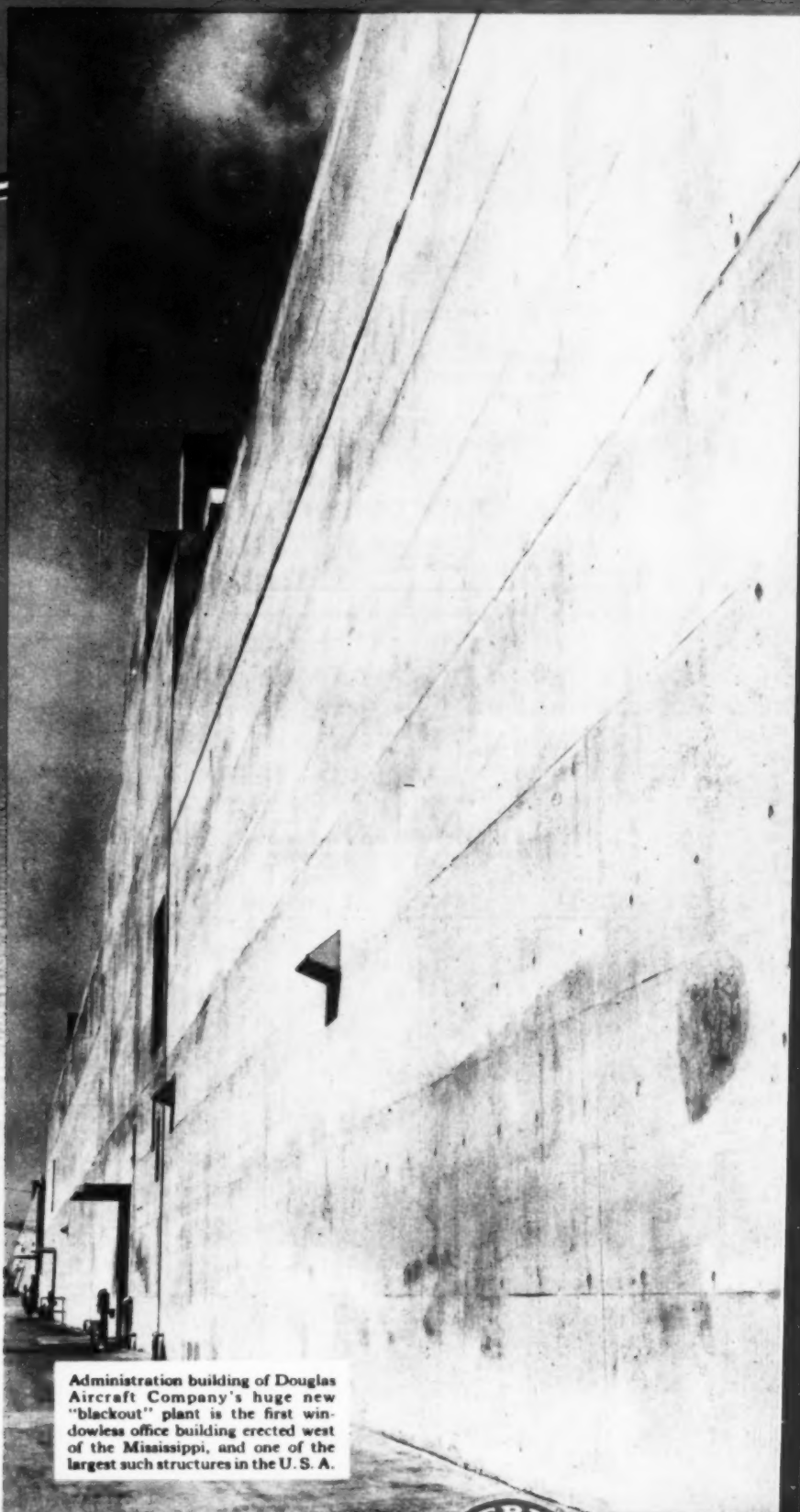
In a normal concrete mix, cement particles tend to bunch together, thereby (1) limiting hydration and (2) trapping water within the cement clumps. (See photomicrograph above).



Cement suspended in water  
**DISPERSED**

#### WITH POZZOLITH

Cement Dispersion drives these particles apart and (1) exposes their entire surface area to hydration, at the same time (2) making the water entrapped in the clumps available for lubrication of the mix. (See photomicrograph above).



Administration building of Douglas Aircraft Company's huge new "blackout" plant is the first windowless office building erected west of the Mississippi, and one of the largest such structures in the U. S. A.

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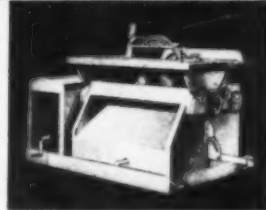
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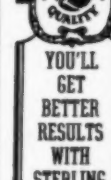
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Tubular Necessary Sleeves and Pile Points.

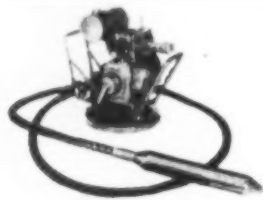
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(Continued from page 133)

states, cities and counties, as well as industries, continue to cooperate in the construction or improvement of access and other military roads which also serve general public traffic.

The road to victory may be found along a strategic or an access highway. Whatever it may be, the Corps of Engineers will maintain it and help the Army to "git thar fustest with the mostest men."

★ ★ ★

## Flat Back Slopes

### Feature

## Road-Grading Job

(Continued from page 39)

where the back slopes range from 1 on 2 to 1 on 14, depending upon the depth of cut and the width of available right-of-way. The slope from the shoulder to the ditch is 1 on 4. Another feature of the design is the rounding out of the tops of the back slopes and the bottoms of ditches.

For grading this section of road the equipment of the contractor, P. W. Ryan Sons, of Janesville, Wis., included five Allis-Chalmers tractors hauling carrying scrapers and operating as bulldozers to level off earth in fills. The scraper equipment included two 7-cu.yd. Continentals, one Bucyrus-Erie and one Austin-Western. From rock cuts material was loaded by a Marion power shovel into three Koehring dumptrucks. The subgrade was brought to proper shape by an Adams self-powered blade grader.

The project involved the moving of 109,000 cu.yd. of earth excavation and 23,000 cu.yd. of rock, drilling equipment being supplied with air from a Gardner-Denver portable compressor. The finished road surface has a width of 41 ft. and a length of about 5 mi.

★ ★ ★

## How to Make Tires

### Last Longer

"IF YOU WANT your tires to give you extra mileage, take it easy on the curves," is warning of P. W. Litchfield, Chairman of the Board of the Goodyear Tire & Rubber Co. Recent tests made of sweepings from curves and straight stretches on an Ohio highway have revealed that tire wear on curves is 1,200 percent greater than on the straightaway.

*For Maximum Speed  
on Defense Projects —  
Only VACUUM CONCRETE will do!*

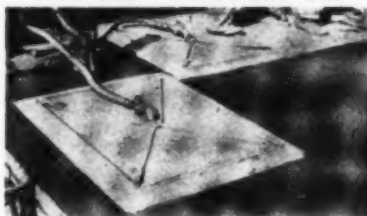


8:00 am — CONCRETE  
8:20 am — SCREED



End of slab concreted; cement finishers start "pulling up."

8:28 am — VACUUM ON



First mats are placed and VACUUM suction applied. Weight of atmosphere on mats squeezes out excess water which is drawn away by suction.

8:33 am — VACUUM OFF



Concrete now hard enough to stand on without imprint! Mats moved ahead.

8:35 am — TROWEL!



Cement finishers start floating and troweling 35 minutes after first concrete was placed. Hours of costly finishing time saved by using VACUUM CONCRETE process!

SOCIAL SECURITY BLDG., WASHINGTON, D. C. McCloskey & Co., Contractors. VACUUM PROCESS SAVED 125,000 sq. ft. of formwork on this bldg. Contractor has used VACUUM CONCRETE on nine jobs in two years.

The logic of VACUUM CONCRETE is simple as a-b-c —

You have to use 5 to 7 gals. of water per sack of cement to make workable concrete.

But 2 to 2½ gals. are enough to hydrate the cement.

Most of the remaining water is worse than useless, once the concrete has been placed. It delays finishing, lowers strength, ties up costly formwork, retards installation of wood block floors.

With VACUUM CONCRETE process you remove excess water just as soon as the concrete has been screeded off. In no other way can all of these benefits be obtained at one time:

60% to 100% higher 3-day strength for quick stripping, faster progress, fewer forms. *Plus*

Finishing started and completed hours earlier winter and summer. Pours can be larger; concrete work completed days or weeks sooner. *Plus*

Earlier installation of wood block floors (20% to 30% less water to dry out of slab). *Plus*

More economical mix; simplified winter protection; harder floor finish; earlier use of monolithic floors!

16,000,000 sq. ft. of VACUUM-processed floors on rush Defense Projects in 1941!  
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